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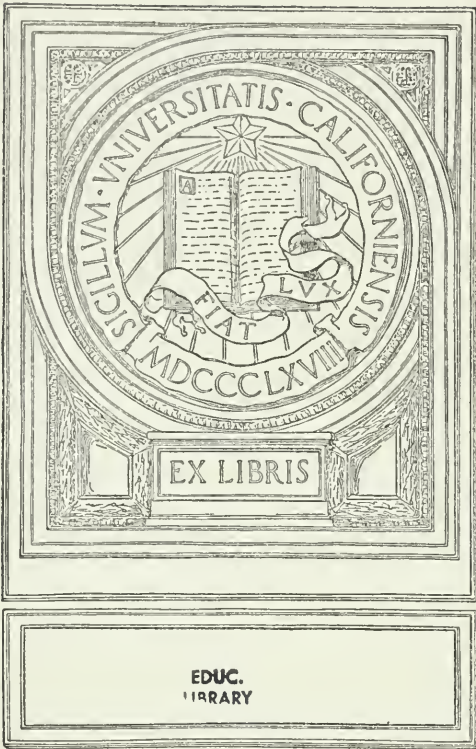
THE REASONING ABILITY OF CHILDREN

BY

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ACKNOWLEDGMENTS

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THE REASONING ABILITY OF CHILDREN OF THE FOURTH, FIFTH, AND SIXTH SCHOOL GRADES

INTRODUCTORY

The Problem

This study is an attempt to secure a concrete basis for some insight into the capacity of children of the fourth, fifth, and sixth school grades for those forms of purposive thinking which we call reasoning. Its scope is comprehended by a consideration of the following questions:

1. The development of tests which may be relied upon as measures of these forms of intellectual activity.

2. Differences, and development of these forms of activity in these three grades of school life.

3. Whether sex differences exist during these years in these types of mental activity.

4. The relation of age to school grade as an index of these phases of capacity.

5. The kind and extent of correlation of these forms of ability one with another.

Description of Tests

The tests employed were made up of a series of problems and questions designed to exercise the most fundamental four phases of reasoning activity, namely: The mathematical judgment; controlled association; selective judgment; and that complex of analytic and synthetic thinking used in the intellectual interpretation of literature.

Mathematical Judgment

The problems for testing the mathematical judgment were of two kinds, two sets of five each, I, A and B, stated in the form

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usually followed in current text-books in arithmetic; and two sets of five each, II, A and B, of the same difficulty as the preceding in processes involved but stated in a less conventional way. Each of the ten problems of the first type may be called a "two-step" problem—it requires a preliminary operation for securing the intermediate datum necessary before the final operation can be accomplished.

Tests I and II

I. A. Get the answers to these problems as quickly as you can.

1. If ¾ of a gallon of oil costs 9 cents, what will 7 gallons cost?

2. John sold 4 sheep for $5 each. He kept ½ of the money and with the other ½ he bought lambs at $2 each. How many did he buy?

3. A pint of water weighs a pound. What does a gallon weigh?

4. At 12½ cents each, how much more will 6 tablets cost than 10 pens at 5 cents each?

5. At 15 cents a yard, how much will 7 feet of cloth cost?

B.

1. A man whose salary is $20 a week spends $14 a week. In how many weeks can he save $300?

2. How many pencils can you buy for 50 cents at the rate of 2 for 5 cents.

3. A man bought land for $100. He sold it for $120, gaining $5 an acre. How many acres were there?

4. A man spent ⅔ of his money and had $8 left. How much had he at first?

5. The uniforms for a baseball nine cost $2.50 each. The shoes cost $2 a pair. What was the total cost of uniforms and shoes for the nine?

II. A.

1. 132 plus what number equals 36?

2. If John had 15 cents more than he spent today he would have 40 cents. How much did he spend today?

3. What number minus 7 equals 23?

4. If James had 4 times as much money as George, he would have $16. How much money has George?

5. What number added to 16 gives a number 4 less than 27?

B.

1. What number subtracted 12 times from 30 will leave a remainder of 6?

2. If a train travels half a mile in a minute, what is its rate per hour?

3. What number minus 16 equals 20?

4. What number doubled equals 2 times 3?

5. If 7 multiplied by some number equals 63, what is the number?

In the original blanks, immediately following each problem space was left for its solution.

Controlled Association

For controlled association, three types of tests were used. First, two sets of ten sentences each, III, A, a and b, were given with a significant word omitted from each to be filled in by the pupil. Second, two sets of ten sentences each, III, B, a and b, were given in each of which two significant words were placed, one above the other, one giving a correct meaning to the sentence, the other an erroneous meaning, the pupil to draw a line through the wrong word leaving the sentence so that it would read correctly. Third, three sets of twenty words each, IV, A, B. and C, were given to pupils, they to write beside each respective word a word just its opposite in meaning—the familiar " opposites " test.

Tests III and IV

III. A. a. Complete the following sentences as quickly as you can by filling the blank spaces with appropriate words:

1. —————————— always comes in the last week in December.
2. A —————————— is one who plays a musical instrument.
3. The city —————————— is in Russia.
4. —————————— are large, visible bodies of watery vapor floating about in the air.
5. —————————— used for building houses are made of clay.
6. The machine used on a railroad for drawing cars is an —————————.
7. —————————— is the most useful metal for blacksmiths.
8. —————————— live and swim about in the water.
9. Most light, summer clothing is made of ————————— goods.
10. —————————— is a holiday.

III. A. b.

1. The flesh of cattle used for food is called —————————.
2. The —————————— months are June, July and August.
3. The —————————— makes it light during the day.
4. —————————— catch many mice and birds.
5. A —————————— is a large stream of water flowing through the land.
6. Men who live in the country and till the soil are called —————————.
7. —————————— is a mineral which we burn.
8. The —————————— Ocean is east of the United States.
9. —————————— sell sugar, vegetables and other foods.
10. There are —————————— hours in half a day.

III. B. a. As quickly as you can, make these sentences correct by drawing a line through the wrong word where two words occur, one above the other:

1. Days are $\frac{longer}{shorter}$ in summer than in winter.

2. Water always flows $\frac{up}{down}$ hill.

3. Glass breaks $\frac{more}{less}$ easily than tin.

4. The sun rises $\frac{earlier}{later}$ in January than in July.

5. Iron is $\frac{softer}{harder}$ than wood.

6. It is $\frac{warmer}{colder}$ in Florida than in Maine.

7. Anything that floats is $\frac{heavier}{lighter}$ than water.

8. Oranges grow $\frac{more}{less}$ satisfactorily in California than in New Jersey.

9. Shadows are $\frac{shorter}{longer}$ in summer than in winter.

10. Plants grow $\frac{more}{less}$ readily in warm sunshine than in the cool shade.

III. B. b.

1. Men are usually $\frac{stronger}{weaker}$ than women.

2. A pound of iron is worth $\frac{less}{more}$ than a pound of copper.

3. Christmas comes $\frac{before}{after}$ Thanksgiving day.

4. Cotton clothing is $\frac{warmer}{cooler}$ than wool.

5. $\frac{Less}{More}$ coal is used in summer than in winter.

6. Bankers are $\frac{poorer}{richer}$ than cab drivers.

7. $\frac{More}{Fewer}$ horses than mules are used for driving purposes.

8. There are $\frac{more}{fewer}$ teachers than preachers.

9. Oranges are $\frac{more}{less}$ sweet than lemons.

10. $\frac{More}{Less}$ bread than cake is eaten in this city.

IV. As quickly as you can write beside each of these words a word that means exactly its opposite:

A.	B.	C.
day	great	bad
asleep	hot	inside
absent	dirty	slow
brother	heavy	short
best	late	little
above	first	soft
big	left	black
backwards	morning	dark
buy	much	sad
come	near	true
cheap	north	dislike
broad	open	poor
dead	round	well
land	sharp	sorry
country	east	thick
tall	known	full
son	something	peace
here	stay	few
less	push	below
mine	nowhere	enemy

Selective Judgment

Two types of tests were used for selective judgment. First, two sets, V, A and B, of two series each of ten reasons why some given fact is true, some of which reasons are correct, the others incorrect or irrelevant, were given. The pupil was to select, by checking, the correct reasons. Second, there were given similarly two sets, VI, A and B, of three series each, of five definitions for a given thing or term, some of which were correct, the others incorrect or irrelevant.

Tests V and VI

V. A. The following reasons have been given to show why New York has become a larger city than Boston. As quickly as you can, place a cross like this, +, before each reason you think a good one:

1. New York is on an island.
2. More foreigners live in New York than in Boston.
3. New York is on a large river coming from a rich agricultural region.
4. Mr. Rockefeller has a fine home in New York.

5. New York has more churches than Boston.
6. New York has better communication with the States lying to the west.
7. New York has elevated railroads.
8. New York is in the midst of a rich fruit and agricultural district.
9. New York is nine or ten years older than Boston.
10. New York has a republican governor.

B.   These reasons have been given to show that oak wood is better than pine for making furniture.   Check the good reasons.

1. Oak wood is harder than pine.
2. Oak trees have acorns, pine trees do not.
3. Oak wood takes a finer polish than pine.
4. Oak trees have more beautiful leaves.
5. Oak trees make good homes for squirrels.
6. Pine wood will not last so long as oak.
7. Pine is more easily dented and defaced than oak.
8. When polished and varnished, oak is much more beautiful than pine.
9. Pine trees are sometimes used for Christmas trees.
10. Oak trees are easier to climb than pine trees.

C.   The following reasons have been given to show why oranges grow better in Florida than in New Jersey.   Check the good reasons.

1. There are many negroes in Florida who work very cheaply.
2. Florida has warm summer weather almost the whole year.
3. There are no alligators in New Jersey.
4. Florida very rarely has hard frosts.
5. New Jersey is not so large as Florida.
6. Florida was settled earlier than New Jersey.
7. New Jersey grows many fine peaches.
8. Florida has a very moist, warm climate.
9. Florida is a word meaning the land of flowers.
10. Florida is a popular winter resort.

D.   Among these reasons why horses are better than cattle for driving and working animals, check those which you think are good reasons.

1. Horses are more intelligent than cattle.
2. Cattle are not so tall as horses.
3. Horses like corn, oats and hay.
4. Horses are much more active and walk faster than cattle.
5. Cattle are extensively used for food.
6. Horses are much more beautiful and graceful than cattle.
7. The skins of horses are sometimes made into gloves.
8. Horses are more easily trained and controlled than cattle.
9. President Roosevelt likes to ride on horseback.
10. Horses have more rapid and varied gaits than cattle.

VI. A. In the following definitions, place a small cross, like this, +, before those which you think are good ones, doing it as quickly as you can.

a. Definitions of a *shoe*.
1. A portion of clothing.
2. Something black made of leather.
3. A protective covering for the feet, usually made of leather, having a firm bottom or sole and flexible upper portions, an opening for the foot being fastened by lacings, buttons or buckles.
4. Something to wear on the feet.
5. A necessary article costing from one to five or six dollars.

b. Definitions of an *island*.
1. A piece of land out in the water.
2. A small body of land.
3. A body of land entirely surrounded by water.
4. Cuba is an island.
5. A portion of land rising above the surrounding level.

c. Definitions of *to explode*.
1. To burst suddenly with a loud noise.
2. To knock all to pieces.
3. To make a very loud noise.
4. To fill the air with a tumultuous roar.
5. To blow up.

a. Definitions of a *chair*.
1. A piece of household furniture.
2. A movable seat with a back intended for one person.
3. A piece of furniture on which to sit.
4. Rocking chairs are comfortable chairs.
5. A single seat having a back.

b. Definitions of *to write*.
1. To make marks with a pen or pencil.
2. To make characters which stand for ideas.
3. To use a pen or pencil.
4. To make marks on any kind of surface with any kind of an instrument which will express one's ideas so that another may understand them.
5. To write a letter.

c. Definitions of a *buggy*.
1. A buggy is black.
2. A buggy is something to ride in.
3. A buggy is a light, four wheeled vehicle, with or without a top or covering, designed for carrying two or three persons.
4. A buggy is drawn by horses.
5. A buggy may have rubber tires.

Literary Interpretation

For literary interpretation, two stanzas of poetry, VII, A and B, were used, the pupil to write the meaning of each in his own words. These poems are taken from a third reader and a second reader respectively, each from a different standard series published within a decade of the time of these tests.

Test VII

VII. A. Read carefully the following stanza, then write its meaning in your own words.

> "This little rill, that from the springs
> Of yonder grove its current brings,
> Plays on the slope awhile, and then
> Goes prattling into groves again,
> Oft to its warbling waters drew
> My little feet, when life was new."

B. Read carefully the following stanza, then write its meaning in your own words:

> "Under the greenwood tree,
> Who loves to lie with me,
> And tune his merry note
> Unto the sweet bird's throat,
> Come hither, come hither, come hither;
>   Here shall he see
>   No enemy
> But winter and rough weather."

Spelling

As an incidental problem for correlation, the opportunity offered for a test in spelling was taken. Two papers, B and C, from test V, the opposites test, were graded in spelling for each pupil. As the pupils did not know that the papers were to be graded in spelling, it had little of the disadvantages of the formal spelling test, yet the words were practically predetermined and uniform.

Children Tested

The children of the upper division of the fourth grade, and of the fifth and sixth grades of public schools number 2, 3, 4, 6, and 9 of Passaic, New Jersey, were given these tests. These

schools furnish types of children representative of about all grades of families usually found in American cities of from twenty-five thousand to fifty thousand population, typically cosmopolitan communities. Children of parents in the various professions, in manufacturing industries, and in the general trades are all found within the group. Complete sets of tests were received from 757 children, 385 boys, and 372 girls. Papers from 834 pupils were received, but because of absence when some of the tests were given the results from 77 were incomplete and were therefore discarded entirely. These were so distributed through the different grades and the different schools that there is no disturbance of the representative character of any group by their omission.

Procedure in Making Tests

The tests were all given within the period of February 13 to 27, inclusive, 1906. They were divided into two groups as follows: Set I: I, A; II, A; III, A, a; III, B, a; III, B, b; IV, A; V, A; V, B; VI, A; VII, A. Set II: I, B; II, B; III, A, b; IV, B; IV, C; V, C; V, D; VI, B; VII, B. The parts of the first set were given consecutively on the same day; after an interval of two or three days the parts of the second set were similarly given.

All of the tests were given by the writer or under his direct supervision. Some assistance was given on two days, one each respectively by Dr. W. C. Ruediger, and Dr. A. M. Stowe, both graduate students in Columbia University at that time and both trained in observation and experimentation. Teachers were asked to eliminate themselves entirely from the situation and were very often absent from the room during the tests. If not absent, they busied themselves usually with routine work of their own. The greatest care was used to preserve the most strict uniformity in making tests and it is believed that a high degree of success was attained in this.

Pupils were given the printed papers containing the questions, one test at a time, face downward, upon their desks. Space was provided upon the papers themselves for all answers. Pupils had been directed to get pencils ready for writing before papers were distributed. When all had received copies of the test, the

children were told to turn the papers over and to write their names and ages at their last birthday at the top of the pages, but to make no other marks upon them until a signal to begin was given. The printed directions at the top of the papers were read aloud to the pupils and the signal to begin was at once given unless experience had indicated a need for some additional word of explanation which was given before the signal to begin. A series of preliminary tests had been given to the respective grades of the Speyer School of New York City for the purpose of testing the tests as to points of manipulation so that any difficulties might be anticipated. When the first pupil to finish had completed his work, in all of the tests but that of IV, the opposites, all turned the papers over, face downward, and they were collected. For the opposites, two minutes were given for each test.

There are certain objections to setting time limits to tests in thinking ability. As Dr. F. L. Wells has said, " Only where the association is so closely controlled as to render but one association possible can the time factor be taken into account."[1] Of the foregoing, tests III and IV do fairly conform to this criterion. For the rest, it is probably true that they are fully " valid only when everyone has done his best regardless of time."[2] However, in a group test some arbitrary limit is necessary. If the slowest pupil were given all the time he wished in which to do his best it would make such a series of tests as here given practically impossible with large groups of children. By the plan used, results show a large proportion of finished papers. Viewed from the standpoint of practical efficiency, the factor of time may be as important as many other factors in any field save that of " pure scholarship."

As a check upon age, grade, and name, after all of the tests had been given each child was furnished a blank form in which he wrote his name, his age at his last birthday, the date of his birth, the name of his school, his school grade, and the name of his teacher.

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[1] Wells, Linguistic Ability and Intellectual Efficiency, *Journal of Philosophy, Psychology, and Scientific Methods*, III, 682.

[2] Wells, Ibid.

What These Tests Really Measure

Meaning of the Term Reasoning

That the solution of any problem, which may be but one form of " response by analogy," is a valid case of reasoning seems to be supported by Spencer who holds that, " It is clear that ordinary syllogistic deductions differ from analogical ones simply in degree."[3] " The foundation of all reasoning is the recognition of *similitude;* reasoning may be roughly defined as the transition from a known fact to a second unknown fact, by means of a resemblance."[4] " The association of images which is established by reasoning takes place through the medium of pre-existing associations which are called premises."[5] " Perception is evidently composed of the same parts as formal reasoning."[6] " Reasoning is that act of the mind which recognizes those relations of any content of consciousness through which it has, or is, what it is."[7] Implicit reasoning " simply goes from the likeness of one case to another without recognizing in what the likeness consists. . . . Explicit reasoning discovers the universal element, the relation of identity, which is at work in implicit reasoning."[7] In all of these expressions, there is a measure of unity in the view that reasoning is but a form of thinking involving a new situation, a kind of apperception, differing from ordinary purposive thinking in degree only, not in kind. But Lloyd Morgan maintains that reasoning applies only where the *why* is involved, not the *what* alone. Reasoning involves the thinking of the *therefore*.[8]

To limit the term reasoning to those instances in thinking in which the justification of the conclusion becomes the subject of reflective thinking, to those in which the thinker raises to consciousness the *why* of Lloyd Morgan as against the *what*, would limit the term to the critical reflections of formal logic and to a relatively few cases in other critical thinking. " The process

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[3] Spencer, Principles of Psychology, II, Part 4, 76.

[4] Binet, The Psychology of Reasoning, tr. from 2d French Ed. by Adam Gowans Whyte, 86.

[5] Ibid., 151.

[6] Ibid., 155.

[7] Dewey, Psychology, 221, 222.

[8] Morgan, Introduction to Comparative Psychology, Chapters XV and XVI.

of thought which the syllogism seeks to describe, *is not that by which the inference is reached, but that by which it is justified;* and in its totality is not gone through at all, unless the needs for justification is suggested."[9]   In his most acute reasonings, the scientist or philosopher no more becomes conscious of the process of his thinking than does the child of ten unless a need arises for its justification or validity.   In neither does the question of " sufficient reason " come to consciousness save when the validity of a conclusion is challenged or must be verified.   The challenge is met by both in the same way—they look back upon the *whats* to see whether the assumed resemblance is valid.   If it is not, then a further search is made for a principle, or *what*, which is true to the purpose.   If the identity *is* further established, the *why*, the *therefore*, is but the expression of faith in the uniformity of nature.   The child naïvely believes in this uniformity and acts, implicitly or unconsciously, upon this belief, just as the scientist acts upon it explicitly and consciously.   " This is the way to work problems like that," is a statement based upon an assumption as implicitly appreciated by the child as it is explicitly depended upon by the critical logician.   When validity is challenged, both are satisfied in the same way, " everything is explained by being brought into connection with something else "[10] taken as valid.   "All inference is a transition from particulars to particulars and not, as is usually supposed, the application of a general affirmation to the special affirmations included in it."[11]   Recognition that a given particular is identical with another particular gives a pragmatic right, whether implicit or explicit, to treat the given as we treat the other.   By thus fulfilling all of the conditions in the given situation, the pupil is led to say that his answer " has " to be right just as the astronomer had a right to say that Neptune " had " to be out there so far away and in such a direction at a given time.

That highest phase of reasoning involved in discovery and invention, to quote Royce, " involves no essentially new mental tendency.   It is a continuation of the consciousness which characterizes the whole thinking process, only of this consciousness

[9] Spencer, Ibid., 98.
[10] Ladd, Psychology, Descriptive and Explanatory, 485.
[11] Mill, John Stuart, quoted by Bain, The Senses and the Intellect, 520.

on a higher level."[12]   " Discovery " and " invention " are but the recognition of previously unnoticed resemblances.   The " sagacity " of the original thinker of the highest order consists in his sharpness of attention and in his keenness in recognizing resemblances, common elements.   The observation and abstraction in a number of cases of a relationship previously unnoticed lead to an hypothesis, a scientific " guess," that the observed relationship is universal under similar conditions.   Newton *notices* the law of squares, Darwin the survival of the fittest.[13] Up to the point of generalization, the reasoning is inductive— the search for and the recognition of common elements.   From the moment the hypothesis is reached, the reasoning is deductive —the application of the discovered resemblance to further individuals by way of verification.   The element wholly unique is simply the *noticing* of a previously *unnoticed* resemblance.   That the mind itself does not " invent " the relationship seems clear. It but takes that which comes, recognizing in a degree measured by its " sagacity " any resemblances which may appear, but helpless to produce anything that does not spontaneously come. " Newton, Mozart, Richard Wagner, and others say that thoughts, melodies, and harmonies had poured in upon them and that they had simply retained the right ones."[14]   In kind, all of these higher activities in purposive thinking are the same as the lower, the difference being one of degree.   The differences in degree are measured by differences in sharpness and persistence of attention, and in keenness in recognizing resemblances.   Probably individual differences are matters of both nature and nurture.   Individuals are born with different degrees of " sagacity," while critical selective judgment is partly a matter of training and development.

Summarizing these observations on the meaning of reasoning in relation to the tests under consideration, we believe that an analysis of the four types of thinking involved will reveal a basis for measures of the most essential elements in the reasoning ability of children of these three grades.   Practically every problem employs deductive thinking.   So far as evidence is

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[12] Royce, Outlines of Psychology, 295.
[13] Adapted from James, Principles of Psychology, II, 343.
[14] Mach, Accident in Invention and Discovery, *Monist*, VI, 174.

available, inductive reasoning is not tested at all. It may have functioned in answering the questions in selective judgment, the choosing of good reasons or definitions from the given lists. The pupil may have read all of the definitions for a given term and derived his own " standard " definition inductively from these. Results provide no possible evidence on this point. However, practically all of the elements in inductive thinking are involved in deductive thinking. Fixed and sharpened attention, keenness in recognizing resemblances, critical selective judgment,—these are vital in both.

Factors in Reasoning Ability Here Measured

Mathematical Judgment

Tests I and II, the problems in arithmetic, test the mathematical judgment, in general that form of deductive reasoning most closely resembling the syllogistic movement of formal logic. The steps here involved are three: First, the analysis of the situation by which the essential features of the problem are conceived and abstracted; second, the recall of an appropriate principle to be applied to the abstracted problem, a search among various principles which may suggest themselves for the right one; and third, involved in the second, the inference, the recognition of identity between the known principle and the new situation. While this process goes on as implicit, explicitly there are made the concrete applications in the resolution of the problems. Clearly these are examples of deductive reasoning of the usual scientific type, involving data, principles, and inferences. The only element omitted is that of verification, which, by the nature of the tests, can not here be brought out.

Controlled Association

Tests III and IV involve the presentation of a definite cue in each case with a very definite field for correct association. In the sentences with the omitted words, one word, or one of a possible very few, only, can be used to make the sentence correct in meaning. In the sentences with the word to be stricken out, the selection is absolutely limited to a choice between two given responses to the given cue. In the opposites test, the mind set given by instructions directs the association definitely from the

cue to a single term, or at most to one of a possible two or three. There is involved, therefore, in all three phases of this test, recognition and selection on the basis of similitude or fitness to purpose as the dominant factor. The activity tested, that of spontaneity and accuracy in recognizing resemblances between the known of experience and the unknown of new situations, is vitally significant in all reasoning.

Selective Judgment

The checking of the good reasons for a given condition or fact, or of good definitions for a given term, among a number of erroneous or poor reasons or definitions, tests V and VI, involves a form of selective judgment, and the movement is one of implicit, deductive reasoning. To judge whether a given reason for a certain condition is good implies general principles or notions of why the condition is as it is. Each given reason must be measured by the appropriate general principle or notion, although this principle or notion will usually be typified by some well-known example of its application. The thinking process here is in the search for the appropriate principles, the comparison of the given reasons with these, the search for and recognition of resemblances, and selection or rejection respectively on the basis of coincidence or irrelevance in meanings. In terms of deductive logic, the given reasons constitute the minor premises, the general notions the major premises, and the inference produces the conclusions in the form of acceptance or rejection of the given reasons. A like process applies in the selection among the definitions.

Literary Interpretation

For the intellectual interpretation of the two poems, test VII, the pupil must abstract the essential thoughts and rethink them in terms of his own phrasing. The problematic character of these tests lies almost wholly in their complex and unfamiliar form of structure. The number of subordinate modifiers with their inverted order and metrical phrasing require, first, a type of grammatical analysis, implicit in children of this age, to be sure, but no less essential. The pupil must break up the total " given " into several parts, connect in mind principal elements remotely separated, then relate in their conventional order the principal

elements and subordinate elements. A second type of analysis lies in the pupil's abstracting the essential thought units in the reconstructed selection, eliminating any elements of expression used solely for the sake of poetic form. Following this is a synthesis of these thought units and an expression of them in familiar terms. In stanza A, the child must be able to pass over in thought from the first phrase in the first line, " This little rill," to line five from which it takes, " Oft drew," then to line six from which it adds, " My little feet," then back to line five for, " to its warbling waters," to get the principal thought in its normal order of expression. The degree of success with which this, and the remaining portions of the analysis and the synthesis are accomplished is certainly a measure of the pupil's ability to break up a complex, and properly to evaluate and relate its parts. A new product has been constructed from given material. As viewed by Binet, " This construction of images according to a new plan is really reasoning."[15]

In these tests then, these pupils have been subjected to various forms of each of four types of reaction which furnish a measure for four somewhat overlapping and related, though quite complex, forms of purposive thinking. It is believed that measures of these qualities properly related will provide fairly reliable measures of what we usually mean by reasoning ability.

Scoring

Tests I and II. For each problem in arithmetic, a grade of 2 was given for each correct solution. If a two-step problem, and one part was right, the other not, the grade given was 1. No detraction was made for inaccuracies in operations.

Test III. In the filling of blanks, and the choice of words, a grade of 1 was given for each correct answer, 0 for each wrong.

Test IV. For the opposites, 2 was given for the correct word, 1 when it was partly right in meaning, and 0 for wrong and omitted words.

Tests V and VI. For choice of reasons and definitions, the scale used was as follows, the grade in each case being the algebraic sum:

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[15] Binet, The Psychology of Reasoning, 170.

V. A. Numbers 3, 6, and 8, each 3 points; 1, 2, 5, 7, and 9,
   each −1 ; 4 and 10, each −2.
   B. 1, 3, 6, 7, and 8, each 2; 2, 4, 5, 9, and 10, each −2.
   C. 2, 4, and 8, each 3 ; 1, 3, 7, 9, and 10, each −1 ; 5 and 6
   each −2.
   D. 1, 4, 6, 8, and 10, each 2; 2, 3, 5, 7, and 9, each −2.
VI. A. a. Number 3, 7 points; 4, 2; 1, −2; 2, −3; 5, −4.
   b, 1, 2 points; 3, 5; 4, 1; 2 and 5, each −4.
   c. 1, 6 points; 5, 3; 2, 3, and 4, each −3.
   B. a. 2, 5 points; 3, 1; 5, 2; 1, and 4, each −4.
   b. 2, 2 points; 4, 5; 5, 1; 1, and 3, each −4.
   c. 2, 2 points; 3, 7; 1, 4, and 5, each −3.

Test VII. From 0 to 10 on basis of estimated merit for each
part.

Test VIII. Spelling. Subtract 1 for each misspelled word
from the arbitrary standard of 15 for each of the two sets of
papers used.

The aims in scoring were twofold, to use a scale giving grades
small enough not to be cumbersome in manipulation, and to
weight in such a manner as to make grades rational. Since the
results were to be rated in terms of relative position only, the
standards used could be entirely arbitrary. But, for a given
mental quality, the rating of each particular problem should be
such as to show its real relationship to the standard adopted in
terms of steps of the scale. Hence, an attempt was made to give
such weighting in the plan of scoring as would give due regard to
rational relationships.

Different Plans of Scoring Tested

As a means of showing that any arbitrary plan of scoring
brings results practically the same as any other plan, providing
individual items are weighted proportionate to their relative
value in terms of the unit used, a sample of different methods
of scoring and their effects is here given.

For test IV, A, the papers of the 25 pupils of School No. 2,
grade 6 B, were scored by four different plans, as follows:

I. That actually used throughout −3 for Nos. 3, 6, and 8; −1
   for 1, 2, 5, 7, and 9.
II. 1 for each of 3, 6, and 8; −1 for each of the others.

III. 2 for each of 3, 6, and 8; −1 for each of the others.

IV. 2 for each of 3, 6, and 8; ignore all of the others.

Arranging results by plan II in comparison with plan I, by relative position, only 3 papers were displaced. Each of the 3 was moved up one step. The steps are smaller, the scale finer. Arranging results by plan III similarly, the order is exactly as by plan I. In the arrangement of results by plan IV, two papers are moved, each up two steps. But the grade of the whole set is moved upward. The scale is coarser and the highest grade is gotten by 17 of the 25 children. The grades upon the different bases are given in the table below.

TABLE I

SCORES OF 25 CHILDREN IN TEST IV, A, BY FOUR PLANS OF SCORING

Child	Plan I	Plan II	Plan III	Plan IV
1	6	1	4	6
2	6	1	4	6
3	3	0	2	4
4	2	−2	0	4
5	−2	−3	−1	2
6	5	0	3	6
7	7	1	4	6
8	7	1	4	6
9	8	2	5	6
10	5	0	3	6
11	1	−1	0	2
12	7	1	4	6
13	2	−3	0	6
14	−2	−2	−2	0
15	3	−1	2	6
16	6	0	3	6
17	5	−1	2	6
18	1	−2	0	4
19	5	−1	2	6
20	3	−2	1	6
21	−6	−4	−5	2
22	6	2	4	4
23	5	0	3	6
24	2	−3	0	6
25	9	3	6	6

Correlations by like and unlike signs of plan I with each of the others give coefficients of .88 with plan II; .92 with plan III; and .80 with plan IV. While plan III is evidently most like that used throughout, plan I, either plan II or III could be used without materially changing the total of results, in this test.

Applying plan II to a sample grade for test IV, B, the relative position is exactly the same, but the grades gotten by plan I

are divided by 2. For plan III, the lower limit of the scale is raised from −10 to −5 and all of the grades are raised in general. Most of all, it gives a wholly wrong result when, in any paper, all of the items are checked, a grade of 5 whereas it should be o, no selective judgment at all.

In test VI, A, a sample grade was scored by plan II. Although it gave a relation coefficient of .77, the scoring is quite unfair as it fails to weight in a test where the items are of markedly different value. For this test, plan III gives a correlation of .92. But it does not weight individual items and is therefore faulty where they really differ. From the standpoints of both rational weighting and manipulation, the scales adopted for scoring seem fairly satisfactory.

Distribution of Children by Grade, Age, and Sex

The problem comprehends an investigation of any differences which may exist in children on the basis of school grade, age, and sex. In all computations, therefore, the sexes are kept separate, and the same computations are made on distributions of results by both grades and ages. For grade studies, computations are first made by the half school years, designated as A and B, then combinations of these are made for each year. For age distribution, the computations are first made upon the basis of half years excepting only the two extreme limits which are represented by numbers so small that results are meaningless save as individual records. Then follow combinations of results for years, and at the upper and lower ends of the distribution for still longer periods.

The following tabulations indicate the distribution of pupils by age, grade, and sex, and are explained sufficiently by titles.

TABLE II

Distribution of Children by Grade, Age, and Sex

Age	Gr.	Boys 4A	5B	5A	6B	6A	T.	Girls 4A	5B	5A	6B	6A	T.	G.T.
8 to 9		2					2	2	1	1			4	6
9 " 9–6		7	3	1	1		12	12	2	2			16	28
9–6 " 10		5	5	1	1	1	13	11	7	5			23	36
10 " 10–6		12	8	7	4	1	32	12	16	5	2	1	36	68
10–6 " 11		18	11	10	13	0	52	15	13	5	8	4	45	97
11 " 11–6		17	8	12	17	9	63	12	12	14	11	5	54	117
11–6 " 12		5	8	4	15	6	38	8	7	9	11	4	39	77
12 " 12–6		11	10	15	14	9	59	7	12	7	18	11	55	114
12–6 " 13		5	9	5	9	9	37	3	5	6	11	13	38	75
13 " 13–6		4	12	6	14	3	39	3	6	2	12	11	34	73
13–6 " 14		4	3	1	4	2	14	2	3	0	5	2	12	26
14 " 14–6		2	1	2	6	4	15	1	1	1	2	1	6	21
14–6 " 15		1	0	1		3	5		0	0	1	2	3	8
15 " 16			1			3	4		1	1		5	7	11
		93	79	65	98	50	385	88	86	58	81	59	372	757

Summary by Grades and Sexes

Grade	4A	5B	5A	6B	6A	4	5	6	T.
Boys	93	79	65	98	50	93	144	148	385
Girls	88	86	58	81	59	88	144	140	372
	181	165	123	179	109	181	288	288	757

TABLE III

Median Age and Variability of Each Grade[16]

	Boys M Yrs.	Mo.	Q Yrs.	Mo.	Girls M Yrs.	Mo.	Q Yrs.	Mo.	Older Boys Mo.	Girls Mo.
Grade										
4A	11	.5	1	5.0	10	7.8		10.16	4.7	
5B	11	8.8	1	1.14	11	0.0		11.17	8.8	
5A	11	9.2	1	5.19	11	4.0		9.37	5.2	
6B	11	10.0		9.91	12	1.1		9.06		3.1
6A	12	4.0	1	.5	12	7.5		8.23		3.5

The Same with Grade Sections Combined

4A	11	.5	1	5.0	10	7.8		10.16	4.7	
5	11	9.0	1	3.16	11	2.0		10.27	7.0	
6	12	1.0		11.20	12	3.2		8.64		2.2
For all	11	8.35	1	2.45	11	6.0		9.69	2.35	

The number of children, both in distribution by grades and by years, is sufficiently large and sufficiently representative to give results which may be rated as really typical and comparable, each with the others.

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[16] For explanation of technical terms, see the section on statistical technique following.

There are 288 children in the fifth grade and the same number in the sixth grade. In the A division of each grade, the number is considerably smaller than in the B division, probably indicating the selection of the better pupils of the grade as a whole, and perhaps also indicating a kind of retardation and repetition.

The sex distribution is also surprisingly nearly equal—exactly equal in the fifth grade with 144 pupils of each sex—and almost equal in the sixth grade—148 boys and 140 girls.

The median ages of both boys and girls are interesting in showing the very small differences in passing from grade to grade, Table III. For four half school years, the median age of the boys lies between 11 years and 11 years, 10 months. The variability in age is seen to be much greater among the boys than among the girls, as shown by a comparison of the Q's.

In the first three half years studied, the median ages of the boys are 4.7 mo., 8.8 mo., and 5.2 mo., higher, respectively, than those of the girls, while in the remaining two half years the median ages of the girls are respectively 3.1 mo., and 3.5 mo. higher than those of the boys. This dropping behind of girls is coincident with that acceleration of physical growth that usually begins at about 12 in girls but which is not evident in boys until about a year later, and is indicative of that inverse correlation usually found between mental ability and rapid physical growth.

Statistical Technique Employed in Computations

No exposition can here be made of statistical methods. A definition of terms used will be given, however, which will enable the reader not versed in statistical technique to interpret intelligently the tables, summaries, and conclusions. For a full treatment of statistical methodology, the reader is referred to " Mental and Social Measurements," by E. L. Thorndike.

For central tendencies, the median, M, the measure above which and below which exactly half of the separate measures lie, is used rather than the average in most cases. It is readily found, conveys no erroneous impression, and gives less weight to extreme cases.

For variability, the 25 per centile, quartile, or Q, is used, rather than the average deviation or standard deviation. The Q is

gotten by counting in from the low end of the distribution until 25 per cent. of the cases are covered; and likewise from the high end of the distribution until the point marking 75 per cent. of the cases is reached. These two values give the limits within which exactly 50 per cent. of all the cases lie. Subtracting the lower value from the higher and dividing the result by 2 gives the variability in steps of the unit of measure used above or below the median within which any individual case will probably be found. Where the number of cases is large, as in this study, this measure is very reliable, and it is easily computed. The single term for variability showing the relationship between the median ability and the Q is the coefficient of variability which is gotten by dividing the Q by the median.

For showing differences of two groups in the same test, or of two tests by the same group, the percentage of the ability in the one test or group reached or exceeded by 50 per cent. of those in the other test or group is frequently used. It is a value easily computed, and its meaning and implications are clear. For the same purpose, the percentage of those in one group who reach or exceed the ability reached or exceeded by the highest 25 per cent. of another group is occasionally used. This compares those above the 75 per centile, those in the highest quartile of ability, and is a good index of relative superiority.

For relationships of abilities, the coefficient of correlation derived from the method of like and unlike signs is used. A high coefficient of correlation between two abilities means that a given degree in one implies a corresponding degree in the other; a low coefficient implies little correspondence of ability; and a negative coefficient implies that any ability above the median or the average in the one involves a corresponding position below the median or average in the other.

Array of Original Scorings

Table IV

As it would be obtrusive to introduce such a volume of data in this place, Table IV is included in an appendix at the close of this study. All original scorings are given in full. All computations made in the study may be verified, or the data may be used in further studies in the thinking abilities of children or for pur-

poses of correlation with other abilities measured. But a beginning has been made in the accurate measurement of the various elements of mental ability. Only by the aggregation of immense numbers of data can valid and adequate conclusions be derived. Such studies involve hundreds of hours of patient labor, and it is decidedly unfortunate that any of the data secured at such cost should be lost. The scorings for this study are therefore given in full with the hope that they may be of service in further investigations.

For the distribution in age, an entirely new array was made of the 757 children on the basis of differences of six months excepting for the groups from 8 years to 9, and from 15 years to 16, which were too small to be subdivided—results from them as group tests would be meaningless.

RESULTS AND THEIR ANALYSIS

MATHEMATICAL JUDGMENT—TESTS I AND II

The results of tests I and II were combined, a single quantity thus representing the summarized valuation of each child's mathematical judgment. However, since the two tests are slightly different, both in degrees of difficulty and in the form of activity measured, an analysis and comparison of the two taken separately follows the treatment of combined results. Below are the tables and summaries of results for grade, age, and sex differences.

TABLE V

FREQUENCY OF ABILITIES BY GRADES

Grade	4A		5B		5A		6B		6A	
Ability	B	G	B	G	B	G	B	G	B	G
2	1	1		2						
3	1	3		1						
4	4	6	2	2				1		
5	1	3		2				1		1
6	6	4	1	4		2		1	1	1
7		5	1			2	1			
8	8	4	1	3		1	1			
9	1	6				1		1		
10	7	5	1	5	2	3	1	1		2
11	4	3		3	2	1		1		1
12	7	11	4	9	2	4	3	1	1	1
13	2	3	1	2	1	2	1	1		
14	4	4	6	3	3	5	2	3		3
15	1	5	1	3	3			2		1
16	4	7	7	6	2	2	2	6		2
17	2	1	1	3	2	2	1	2		
18	8	2	1	2	2	3	1	3		2
19	3			5		1	5	1	1	
20	6	4	8	9	4	2	4	5	2	3
21		2	1	2	2	4	1			
22	2	2	9	5	5	3	6	8	1	5
23	6	1	1	2	3	2	3	2	1	
24	6	3	11	3	3	2	6	6	4	1
25	1		3		2	1	4	1		
26	3	1	8	4	5	3	11	4	7	7
27		2	1		1		1		1	3
28	1		1	1	6	3	11	6	6	
29	1			1	3	2	1		2	6
30			4	1	2	2	4	8	2	1
31						1	2	1	1	3
32	1		4	1	4	2	10	5	6	8

Grade Ability	4A B	4A G	5B B	5B G	5A B	5A G	6B B	6B G	6A B	6A G
33				1	2		2		1	3
34	1				1	1	3	3	4	1
35					1		1		2	
36	1				1		6	4	3	3
37				1		1	1		1	
38				1	1		2	2	3	1
39										
40							1	1		
Cases	93	88	79	86	65	58	98	81	50	59

TABLE VI

MEDIAN ABILITY AND VARIABILITY FOR EACH GRADE

Grades	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts of Var. Boys	Co'ts of Var. Girls
4A	14.50	11.36	3.14		5.39	4.21	.37	.37
5B	21.39	15.66	5.73		4.75	4.71	.22	.30
5A	22.83	19.00	3.83		5.58	6.46	.24	.34
6B	25.63	24.08	1.55		4.95	6.42	.19	.26
6A	28.00	25.92	2.08		3.96	5.95	.14	.22

Combining the half years of Grades 5 and 6

Grades	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts of Var. Boys	Co'ts of Var. Girls
5	22.11	17.33	4.78		5.10	5.58	.25	.32
6	26.81	25.00	1.81		4.45	6.18	.16	.24
For all	22.60	17.75	4.85		6.07	6.96	.26	.38

Per Cent. of Each Grade Reaching the 75 Per Centile of All

Asking this question, If we wish to select from each grade those pupils who reach or exceed the ability reached by the highest 25 per cent. of all children of each sex taken together, what per cent. will be found in each grade, respectively, we get the following answer:

Grade	4A	5B	5A	6B	6A
Boys	5.37	12.65	32.30	44.89	62.00
Girls	3.40	6.97	20.68	37.02	44.04

That is, 5.37 per cent. of the boys of grade 4A reach or exceed the ability reached by the highest 25 per cent. of all of the boys taken together in this test; 12.65 per cent. of the boys of grade 5B; and so on. By a mere accident of coincidence, the number of boys in 25 per cent. of the whole number, 385, is 96, so that these per cents. also roughly represent the per cents. of the whole group above the 75 per centile which are from each respective grade. Thus, 5 per cent., more exactly 5.2 per cent., of all of the highest quarter of boys are from grade 4A, and so on. As the number of girls is 472, the approximations are also true for them.

Sex Differences by Grades

Other than the evident differences in the foregoing, the simplest summary of sex differences is in a statement of the per cents. of the boys who reach or exceed the ability reached by 50 per cent. of the girls, as given below:

Grade	4A	5B	5A	6B	6A
Per cent.	61.8	71.3	70.7	60.8	65.1

TABLE VII

FREQUENCY OF ABILITIES BY AGES

Ability	8–10 B	8–10 G	10–11 B	10–11 G	11–12 B	11–12 G	12–13 B	12–13 G	13–14 B	13–14 G	14–16 B	14–16 G
2		1		1	1		1					
3				2			1	1		1		
4	1	4	1		1	1	1	4	1		1	
5				3	1	1		1		2		
6	2	3	3	3		2	1	2	1	1	1	1
7		1		2			3	2	1			
8	3	1	3	1	1	2			3	3	1	
9		3		2	1	1			1		1	
10	2	2		5	5	5		1	3	1	1	2
11	1		1	2	2	3		2	1		1	2
12		5	5	5	5	5	5	5	2	4		2
13			3	2	1	2	2	1	1			
14		4	4	3	3	6	3	3	5			2
15		1	4	3	4	1	2					1
16		3	5	7	6	8	2	4	2	1		1
17		3	1	2			5	1	2			
18	2		4	1	2	7	4	2	1	1		1
19		1	3	1	4	1	1	1	1	2		1
20	2	1	8	6	4	2	7	9	3	5	1	
21		1	1	2	2	2	2	1	1	1		
22			5	5	6	6	10	8	1	3	1	
23	1		2	4	6	2	2	1	3			
24	2	2	7	3	8	3	6	3	2	3	5	1
25			2		2	1	1	1	3			
26	2	4	7	3	7	3	8	7	4	2	4	
27		1	1		3	1		1		1		1
28		1	5	3	3	3	11	1	4	2	2	
29	1				2	6	3	1	1	1	1	1
30	3		1	2	7	2	1	5	2			
31			1		1	1	1	2	2			
32	2		4	5	4	2	8	8	5	2	2	
33			1		2	2	1	1		1	1	
34			2		1	2	3	1	2	2	1	
35					1			2	1			
36	2	1	2	1	5	1	1	4	2	1		
37		1	1		1				1			
38	1		2				2	2	1		1	
39												
40			1				1					
Cases	27	43	84	81	101	93	96	93	53	46	24	16

TABLE VIII

Median Ability and Variability for Each Age

Age	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
8 to 9	16.50	15.50	1.00		7.00	7.50	.42	.48
9 " 9-6	21.00	10.50	10.50		10.70	7.25	.50	.69
9-6 " 10	23.50	13.75	9.75		10.81	5.25	.46	.38
10 " 10-6	19.00	15.40	3.60		7.72	5.50	.40	.35
10-6 " 11	21.75	16.50	5.25		4.00	6.39	.18	.38
11 " 11-6	21.50	15.50	6.00		5.74	6.20	.26	.40
11-6 " 12	23.50	20.50	3.00		6.89	6.75	.29	.32
12 " 12-6	23.10	21.58	1.52		5.08	8.37	.22	.38
12-6 " 13	22.50	19.50	3.00		6.06	6.04	.27	.30
13 " 13-6	22.25	21.00	1.25		7.06	6.12	.31	.29
13-6 " 14	21.50	19.50	2.00		9.00	11.50	.41	.58
14 " 14-6	23.87	12.50	11.37		2.68	4.00	.11	.32
14-6 " 15	31.50	15.50	16.00		3.75	6.25	.12	.40
15 " 16	24.50	11.50	13.00		14.50	3.75	.58	.32

Combining Half Years, and Smaller Groups:

Age	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
8 to 10	22.50	13.37	9.13		10.02	6.00	.44	.44
10 " 11	21.40	15.64	5.76		5.20	5.78	.24	.36
11 " 12	22.41	17.50	4.91		6.19	7.03	.27	.40
12 " 13	23.00	20.75	2.25		5.40	7.83	.23	.37
13 " 14	22.16	20.00	2.16		7.09	7.37	.32	.36
14 " 16	25.00	13.50	11.50		3.00	3.75	.12	.27

Combining Further the Extreme Groups:

Age	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
8 to 11	21.50	15.20	6.30		6.05	6.21	.23	.40
13 " 16	23.50	19.00	4.50		6.98	7.33	.29	.38

Per Cent. of Each Age Group Reaching the 75 Per Centile of All

Age	8-11	11-12	12-13	13-16
Boys	27.02	26.13	34.37	29.87
Girls	17.74	27.95	35.48	29.01

This summary tells us that if we should select all the boys in these grades who are in the highest 25 per cent. of all of them taken together in this test, 27.02 per cent. of all of the boys whose age lies between 8 and 11 years would be in the group; 34.37 per cent. of the boys who are from 12 to 13 would be in the group; and so on.

Comparison of Youngest and Oldest 25 Per Cents. of the A Grades

To compare youngest pupils and oldest pupils in several grades, groupings were made of the youngest 25 per cent. and the oldest 25 per cent. of the pupils, by sexes, in grades 4A, 5A, and 6A, respectively. The summary of results is shown in the following table:

TABLE IX

YOUNGEST AND OLDEST PUPILS OF SEVERAL GRADES COMPARED

Boys

Grade		Median Age Yrs.	Mo.	M's	Higher Younger	Older	Q's	Co'ts. of Var.
4A	Younger 25%	9	8.0	11.50			5.87	.51
	Older "	12	9.5	12.66		1.16	4.50	.35
	Whole Grade	11	.5	14.50			5.39	.37
5A	Younger 25%	10	2.5	25.50			6.68	.26
	Older "	13	.5	22.75	2.75		3.93	.17
	Whole Grade	11	9.2	22.83			5.58	.24
6A	Younger 25%	11	1.5	28.00			5.50	.19
	Older "	14	5.5	27.50	.50		4.62	.16
	Whole Grade	12	4.0	28.00			3.96	.14

Girls

Grade		Median Age Yrs.	Mo.	M's	Higher Younger	Older	Q's	Co'ts. of Var.
4A	Younger 25%	9	4.0	11.50			4.18	.36
	Older "	12	3.5	11.60		.10	5.00	.43
	Whole Grade	10	7.8	11.36			4.21	.37
5A	Younger 25%	9	10.5	21.50			4.69	.21
	Older "	12	6.5	19.75	1.75		12.25	.62
	Whole Grade	11	4.0	19.00			6.46	.34
6A	Younger 25%	11	0.0	31.00			2.50	.08
	Older "	14	6.5	16.00	15.00		5.75	.36
	Whole Grade	12	7.5	25.92			5.95	.22

From this table it will be observed that, for both boys and girls, the group of the youngest 25 per cent. in each grade reaches a higher median ability than an equal number highest in age for that grade excepting in grade 4A. The median ability of the whole respective grade is reached or exceeded by the older 25 per cent. of the girls in grade 4A, by both boys and girls in grade 5A excepting the group of older boys, and by both the younger boys and the younger girls of grade 6A.

Six Differences by Age

TABLE X

PER CENT. OF BOYS REACHING MEDIAN ABILITY OF GIRLS

Age	Per Cent. For Half Years	Age	Per Cent.	Age Combining Half Years and Smaller Groups	Per Cent.
8 to 9	50.00	12 to 12–6	67.79	8 to 10	66.66
9 " 9–6	75.00	12–6 " 13	67.56	10 " 11	78.56
9–6 " 10	61.53	13 " 13–6	56.41	11 " 12	70.28
10 " 10–6	65.62	13–6 " 14	57.14	12 " 13	62.50
10–6 " 11	80.76	14 " 14–6	86.66	13 " 14	60.37
11 " 11–6	73.01	14–6 " 15	80.00	14 " 16	83.33
11–6 " 12	65.78	15 " 16	75.00		

In every age group, the boys reach or exceed the median ability of the girls, in that group.
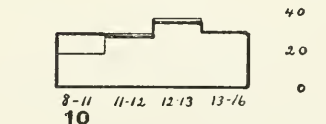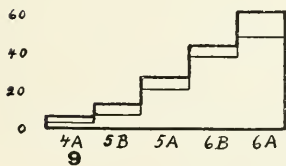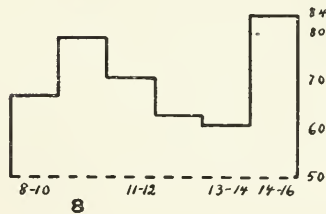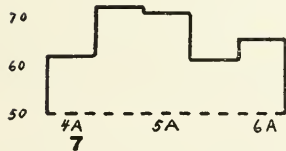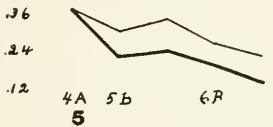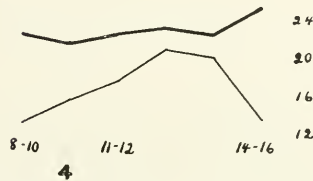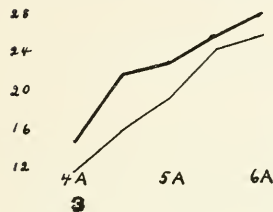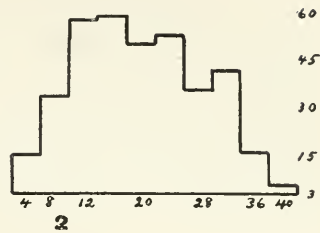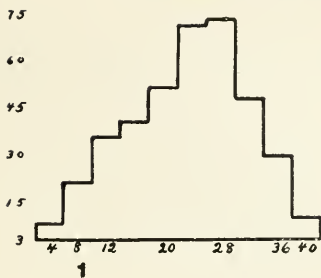
FIGURES 1–10.

TESTS I–II

1. Frequencies of Abilities, Boys.
3. Median Ability, by Grades.
5. Variability, by Grades.
7. Per Cent. of Boys Reaching the 50 Per Centile of Girls, by Grades.
9. Per Cent. of Pupils Reaching the 75 Per Centile of All, by Grades.
————— Boys.

2. Frequencies of Abilities, Girls.
4. Median Ability, by Age.
6. Variability, by Age.
8. Per Cent. of Boys Reaching the 50 Per Centile of Girls, by Age.
10. Per Cent. of Pupils Reaching the 75 Per Centile of All, by Age.
————— Girls.

Differences Between Tests I and II

Test I involves two-step problems of the conventional type found in school practice, while in test II all of the problems but two involve a single operation each, but the statement of the problem is unusual in form. Processes involved are alike and of approximately equal difficulty. The following table will indicate differences in results for the two tests.

TABLE XI

MEDIAN ABILITY AND VARIABILITY OF TESTS I AND II

	Boys				Girls			
	M's		Q's		M's		Q's	
Grades	I	II	I	II	I	II	I	II
4A	6.12	7.53	3.77	3.05	4.80	5.87	3.11	2.08
5B	9.87	11.02	2.88	3.18	5.50	9.25	3.47	2.94
5A	11.05	11.61	3.20	2.86	7.16	10.00	3.45	3.05
6B	13.00	13.41	3.48	3.64	9.88	13.04	3.23	3.28
6A	14.50	15.13	2.37	2.07	11.87	14.64	2.73	3.17
Averages	10.90	11.74	3.14	2.96	7.84	10.50	3.19	2.90

A comparison of medians for individual grades, and of averages, indicates that for both boys and girls test I is clearly more difficult than test II. The average variability is also greater for test I, as it is in the individual grades excepting 5B and 6B for boys, and 6B and 6A for girls. The difference may be brought out further by the following summary which shows the per cent. of those who in test II reach or exceed the ability reached by 50 per cent. of them in test I.

Grades	4A	5B	5A	6B	6A	Averages
Boys	59.13	63.29	58.46	59.18	56.00	59.21
Girls	70.45	87.20	79.31	76.54	72.88	78.67

For both boys and girls, the difference in the difficulty of the two tests is greatest in grade 5B. For girls, there is progressive diminution in difference through the remaining grades. For boys, there is a break in the progress in grade 6B.

Sex Differences between the Tests

The foregoing indicates that throughout both tests are more difficult for the girls than for the boys, and that test I is proportionately harder throughout for the girls. The per cent. of

boys who reach or exceed the ability reached by 50 per cent. of the girls expresses this relative superiority for the boys.

Grades	4A	5B	5A	6B	6A	Averages
Test I	58.2	84.4	74.1	64.4	71.3	70.4
Test II	73.8	60.4	60.0	56.4	54.7	61.6

In test II, the sex difference progressively diminishes through these five groups from the relative position 73.8 in grade 4A to 54.7 in grade 6A.

Summary for Mathematical Judgment—Tests I and II

Grade Differences

A study of the median abilities of the respective grades, Table VI, shows progress through these from grade to grade for both boys and girls. The boys make a gain of 93.10 per cent. on their median ability for grade 4A, the girls 128.16 per cent. The greatest gain in per cent. from one grade to the next for both is from 4A to 5B. The smallest gain is, for boys, from grade 5B to 5A; for girls, from 6B to 6A.

An examination of the summary of those from each grade who reach the 75 per centile of all, page 25, indicates that we might make a new grouping of children having the common ability indicated by the 75 per centile of these tests, taking a certain proportion of the children from each grade. Results here show that in these grades we would take 5.37 per cent. of the boys from grade 4A; 12.65 per cent. from 5B; and so on, up to 62.00 per cent. for grade 6A. In other words, in the abilities measured by these tests, 5.37 per cent. of the boys in grade 4A belong to the same group with 62.00 per cent. of the boys of grade 6A. For girls, a similar new grouping is in evidence, but the proportion from every grade would be smaller. Such a new grouping is valid in just the measure in which these tests are valid as measures of certain forms of ability which we call mathematical.

In these tests, variability diminishes from grade 4A upward. However, it is a little higher for grade 5A than for grade 5B for both sexes. Reference to the Q's and coefficients of variability in Table VI, and to Figure 5 will show these tendencies.

Age Differences

From the array of median abilities by half years, Table VIII, the regularity of progression found on the basis of school grades is not at all in evidence. A rhythm in ability is fairly apparent for the boys with its first crest at about 9 yrs. 6 mo., the second at about 12 yrs., and the third at about 14 yrs. 6 mo., each crest a little higher than the preceding. The median for the period 13 yrs. 6 mo. to 14 yrs., is just the same as that for the period 11 yrs. to 11 yrs. 6 mo., each 21.50, the interval being the same as that measuring the crests of the rhythm, 2 yrs. 6 mo. For the girls, there is evident, though not so clearly, a rhythm with its crests about coincident with the valleys of the rhythm for the boys, excepting at the period 11 yrs. 6 mo. to 12 yrs. 6 mo., where the crests become nearly parallel. In general, however, the more evident element in the array of median abilities of girls may be described as their general rise from median 10.50 at 9 yrs. to median 21.58 at 12 yrs., then their fall to median 12.50 at 14 yrs. For both the rhythm appearing in the array for boys and the general rise and fall in the array for girls, the age distribution for years instead of half years lends additional clearness.

From the per cent. of each age group reaching the 75 per centile of all, page 27, the relation of the distribution of higher abilities to age is very evident. If we should group these pupils reaching the 75 per centile in ability, the smallest proportion of any age group would come from those from 11 to 12 years in age, the largest from the group from 12 to 13 years, for boys. For the boys, there is a larger percentage of the group of higher ability in the age period from 8 to 11 years than in that of 11 to 12 years. For girls, the largest percentage also comes from the year 12 to 13 while the smallest is from the year 8 to 11. For the years 11 to 12, and 12 to 13, the percentage is larger in both cases than that of boys. For the period 13 to 16, they are almost the same—there is a difference of less than 1 per cent. In so far as these tests and these children are typical, then, we can predict that of any group of children of these grades a larger proportion of those pupils who are from 12 to 13 will be found to be in the highest group as to ability than of those who are from 13 to 16 for both boys and girls, and for

boys, more who are from 8 to 11 than who are from 11 to 12. The rhythm of Table VIII is evident in the selected group.

In the arrays of results by half years and years, in the comparison of the youngest and oldest 25 per cent. of the pupils in the respective grades, and in the arrays of children reaching or exceeding the 75 per centile of all, either by grade or age, we have a contrast of the higher degrees of native ability of the youngest pupils and of lower degrees of native ability in the oldest pupils. Retardation seems evident in the pupils of each respective grade who are from two to four years older than the median age for that grade. There also seems evident another type of retardation in these special abilities, perhaps quite as important, in those pupils who are from two to three years *younger* than the median age for their respective grades, but *who are in the group exceeding in ability the 75 per centile for all*. In tests in which progress from grade to grade and year to year is so very evident, in large groups as here shown, these wide divergencies in ability of lowest and highest quarters of these respective groups indicate that native ability is measured by the tests quite as much as school training. Children with from 3 to 5 years of experience and training more than a corresponding number of other children frequently do not do so well as the group of fewer years and less experience but with greater ability by nature.

With the same high coefficient of .44 in the age group 8 to 10 years, the variability of both sexes diminishes with age, excepting that from 11 to 12 it is slightly higher for both than from 10 to 11, and that it rises rather abruptly for boys at 13 to 14. The general fall, and the rhythm in variability for the boys, are evident in Figure 6.

Sex Differences

Other than the specific differences pointed out in the foregoing, the one marked sex difference is that of the superiority of the boys in these tests. By every distribution, in every one of its respective divisions, the boys are shown to be more able than the girls excepting in two cases of selected groups, one from grade 4A, the other from grade 6A. In the youngest 25 per cent. of the former grade, the girls just equal the boys in median abil-

ity, while for the corresponding group for the latter grade the girls slightly excel. The percentage of all of the boys reaching or exceeding the ability reached by 50 per cent. of all of the girls is 71.43. The median ability of all of the boys taken together is 22.60 with a coefficient of variability of .26; of the girls, is 17.75 with a coefficient of .39. While the median ability of the boys is 27.73 per cent. higher than that of the girls, the coefficient of variability is 33.33 per cent. lower. As shown in Table VI, the sex difference diminishes as we proceed up the grades from 4 to 6. Should we proceed far enough, we might reach the condition found by Fox and Thorndike in a study of 28 boys and 49 girls of high school age where " girls do about 5 per cent. better on the whole than boys."[17]

Controlled Association—Tests III and IV

.The three parts of the tests for controlled association are III A, the filling of blanks in sentences with appropriate words; III B, the crossing out of one of two significant words in sentences leaving the word which makes the sentence read correctly; and IV, three sets of easy opposites. The combined results of III A and III B are here used but the differences between the results of the two parts of the test are summarized after the tables and results for the combined values.

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[17] Fox and Thorndike, The Relations between the Different Abilities Involved in the Study of Arithmetic, *Columbia University Contributions to Philosophy, Psychology, and Education*, ix, No. 2, 38.

Test III

TABLE XII

FREQUENCY OF ABILITIES BY GRADES

Grade Ability	4A B	4A G	5B B	5B G	5A B	5A G	6B B	6B G	6A B	6A G
9	2									
10	1									
11										
12	1									
13		2								
14										
15	1		1							
16	1									
17		1								
18	3	3	1	1						
19		1	2		4	1				
20	1	3	2			2		1		
21	5	3	1			1		1		1
22	2	6	3	2		3				
23	3	7	2	1	2			2		1
24	3	3	1	4	4	3	2	2		
25	12	4	6	1	2		1	1		
26	3	5	4	4	1	2	2	2		1
27	6	4	2	6	4	2	1	4		
28	7	4	7	11	2	2	7	5	3	3
29	11	9	6	9	4	5	5	6	2	3
30	4	6	2	11	3	4	8	5	4	4
31	5	4	6	9	12	11	8	4	2	5
32	3	6	10	12	7	5	9	10	5	5
33	3	7	5	5	2	5	13	12	8	8
34	7	6	3	3	9	7	10	3	9	6
35	6	3	11	3	5	1	13	10	6	4
36	2	1	1	2	2	3	10	7	4	9
37	1		1	2	2		5	6	4	6
38			2			1	4		3	3
Cases	93	88	79	86	65	58	98	81	50	59

TABLE XIII

MEDIAN ABILITY AND VARIABILITY FOR EACH GRADE

Grades	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
4A	27.35	27.50		.15	3.36	4.37	.12	.15
5B	29.75	29.36	.39		3.73	2.11	.12	.07
5A	30.54	30.36	.18		3.19	2.62	.10	.08
6B	32.46	31.75	.71		2.38	2.95	.07	.09
6A	33.11	32.81	.30		1.72	2.50	.05	.07

Combining the Half Years of Grades 5 and 6:

	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
5	30.14	29.86	.28		3.46	2.36	.11	.08
6	32.78	32.28	.50		2.05	2.72	.06	.08
For all	30.54	29.61	.93		3.25	3.40	.16	.11

Per Cent. of Each Grade Reaching the 75 Per Centile of All

Grade	4A	5B	5A	6B	6A
Boys	17.20	22.77	27.68	42.85	52.00
Girls	19.31	17.43	29.30	46.89	60.98

The diminished ability of the girls in grade 5B, and the relative superiority of the girls throughout excepting in this grade, are the most significant features of the array for this selected group.

Sex Differences by Grades

Per Cent. of the Boys Reaching the 50 Per Centile of the Girls

Grade	4A	5B	5A	6B	6A
Per Cent.	48.9	50.9	53.3	58.3	55.2

TABLE XIV

FREQUENCY OF ABILITIES BY AGES

Ability	Age 8–10 B	G	10–11 B	G	11–12 B	G	12–13 B	G	13–14 B	G	14–16 B	G
9			1		1							
10									1			
11												
12									1			
13							1			1		
14									1			
15			1				2		1		1	1
16				1		1	1					
17				2		1	3			2		
18		2	1	2	1	2	3		1	2		
19			1					2	1	4		
20		2	1	2			1	1	1	1		1
21	1		1		1	3	1	1	1	2	1	
22	1	4	1	2	1	2	1	1		1	1	1
23	1	3	2	2	2	3	1	2	1	2		
24	1	1	1	4	3	1	4	2	1	2		2
25	1	2	7		5	3	6	2	2		1	
26	2	1	2	2	3	6	2	4	1	1		
27	1	1	2	1	5	7	3	4	2	1		2
28	2	2	5	4	6	8	7	6	4	1	2	1
29	5	4	5	9	8	8	4	5	6	3		2
30		3	4	9	3	4	12	11		4	2	
31	2	4	8	4	10	12	9	4	3	6	1	1
32	2	7	9	9	5	5	12	10	6	2		2
33	3	1	6	7	7	9	9	12	2	4	3	
34	1	4	10	8	13	4	6	4	4	2	4	1
35	2	1	11	5	15	3	6	3	5	4	2	
36	1	1	3	4	4	6	5	5	2	2	4	1
37			1	4	4	4	3	2	4	2	1	1
38	1		1		4	1	2	2			1	1
Cases	27	43	84	81	101	93	96	93	53	46	24	16

TABLE XV

Median Ability and Variability for Each Age

Age	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
8 to 9	24.50	27.00		2.50	1.00	8.25	.04	.30
9 " 9–6	29.50	27.50	2.00		3.50	4.56	.11	.16
9–6 " 10	28.83	29.75		.92	2.31	3.34	.08	.11
10 " 10–6	31.00	31.00			4.30	2.83	.14	.09
10–6 " 11	30.75	29.64	1.11		3.07	2.64	.10	.09
11 " 11–6	31.12	29.50	1.62		3.60	3.10	.11	.10
11–6 " 12	32.00	28.90	3.10		2.86	2.76	.09	.09
12 " 12–6	30.37	30.16	.21		2.68	3.13	.08	.13
12–6 " 13	30.50	29.00	1.50		2.40	4.29	.07	.14
13 " 13–6	28.70	29.33		.63	4.52	4.56	.15	.15
13–6 " 14	31.00	31.00			4.00	6.66	.13	.21
14 " 14–6	33.37	27.50	5.87		2.16	5.00	.06	.18
14–6 " 15	29.50	31.50		2.00	2.25	7.75	.07	.24
15 " 16	32.50	27.50	5.00		6.50	2.25	.20	.08

Combining Half Years and Smaller Groups:

Age	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
8 to 10	28.70	28.87		.17	3.27	4.27	.11	.14
10 " 11	30.87	27.12	3.75		3.25	2.76	.10	.10
11 " 12	31.30	29.37	1.93		3.28	3.12	.10	.10
12 " 13	30.44	29.59	.85		2.67	3.41	.08	.11
13 " 14	28.91	30.00		1.09	4.40	4.81	.15	.16
14 " 16	33.00	28.00	5.00		3.50	4.00	.10	.14

Combining Further the Extreme Groups:

Age	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
8 to 11	30.55	29.75	.80		3.35	3.42	.16	.11
13 " 16	30.87	29.50	1.37		3.92	4.62	.12	.15

Per Cent. of Each Age Group Reaching the 75 Per Centile of All

Age	8-11	11-12	12-13	13-16
Boys	27.92	39.60	22.90	35.04
Girls	28.22	29.02	30.10	29.01

The rhythm for boys in this selected group is very apparent, as is also the general rise for the girls to the 12-13 year period with the subsequent fall. The maximum for the girls is one year later than for the boys.

Comparison of Youngest and Oldest 25 Per Cents. of the A Grades

TABLE XVI

Youngest and Oldest Pupils of Grades A Compared

Boys

Grade		Median Age Yrs.	Mo.	M's	Higher Younger	Older	Q's	Co'ts. of Var.
4A	Younger 25%	9	8.0	26.00			5.50	.21
	Older "	12	9.5	27.00		1.00	3.50	.13
	Whole Grade	11	.5	27.35			3.36	.12
5A	Younger 25%	10	2.5	30.16			1.93	.06
	Older "	13	.5	30.16			3.35	.11
	Whole Grade	11	9.2	30.54			3.19	.10
6A	Younger 25%	11	1.5	32.50			1.00	.03
	Older "	14	5.5	33.50		1.00	1.58	.05
	Whole Grade	12	4.0	33.11			1.72	.05

Girls

Grade		Median Age Yrs.	Mo.	M's	Higher Younger	Older	Q's	Co'ts. of Var.
4A	Younger 25%	9	4.0	25.50			4.21	.16
	Older "	12	3.5	24.50	1.00		5.25	.21
	Whole Grade	10	7.8	27.50			4.37	.15
5A	Younger 25%	9	10.5	31.25			2.28	.07
	Older "	12	6.5	30.16	1.09		3.16	.14
	Whole Grade	11	4.0	30.36			2.62	.08
6A	Younger 25%	11	0.0	31.50			8.50	.27
	Older "	14	6.5	31.33	.17		3.25	.13
	Whole Grade	12	7.5	32.81			2.50	.07

In this test, the pupils of the younger groups equal or exceed the older pupils in median grade in all but the 25 per cent. for boys in grades 4A and 6A. In these grades, the superiority of the older groups is very small, less than 4 per cent. None of these groups reaches the median ability of its whole respective grade excepting the younger girls in grade 5A and the older boys in grade 6A.
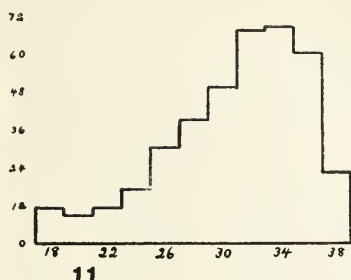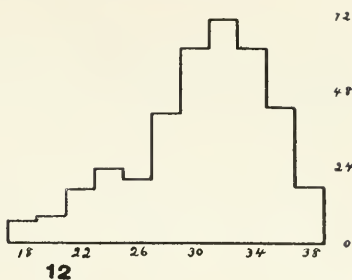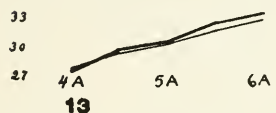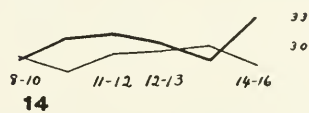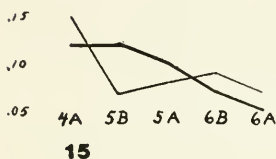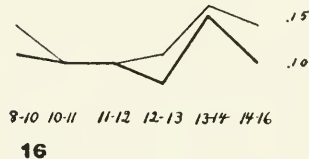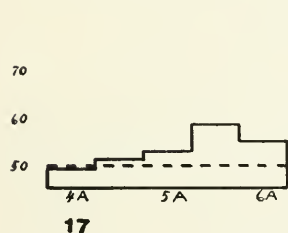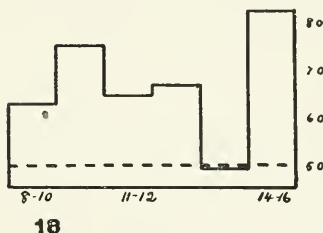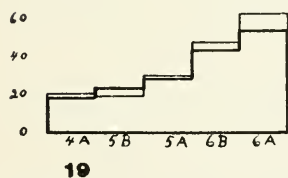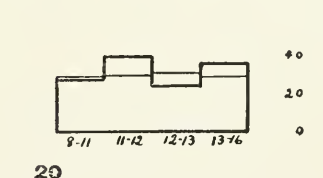
FIGURES 11–20.

TEST III

11. Frequencies of Abilities, Boys.
13. Median Ability, by Grades.
15. Variability, by Grades.
17. Per Cent. of Boys Reaching the 50 Per Centile of Girls, by Grades.
19. Per Cent. of Pupils Reaching the 75 Per Centile of All, by Grades.
———— Boys.

12. Frequencies of Abilities, Girls.
14. Median Ability, by Age.
16. Variability, by Age.
18. Per Cent. of Boys Reaching the 50 Per Centile of Girls, by Age.
20. Per Cent. of Pupils Reaching the 75 Per Centile of All, by Age.
———— Girls.

Sex Differences by Age

TABLE XVII

PER CENT. OF THE BOYS REACHING THE 50 PER CENTILE OF THE GIRLS

		For Half Years				Combining Half Years and Smaller Groups	
Age		Per Cent.	Age		Per Cent.	Age	Per Cent.
8	to 9	00.00	12	to 12–6	52.54	8 to 10	62.96
9	" 9–6	75.00	12–6	" 13	75.67	10 " 11	75.00
9–6	" 10	46.15	13	" 13–6	46.15	11 " 12	64.36
10	" 10–6	62.50	13–6	" 14	57.14	12 " 13	66.66
10–6	" 11	63.46	14	" 14–6	86.66	13 " 14	49.06
11	" 11–6	61.90	14–6	" 15	40.00	14 " 16	83.33
11–6	" 12	78.94	15	" 16	75.00		

In this test, more than 50 per cent. of the boys in each age group by half years reaches or exceeds the median ability of the respective groups of girls excepting in the three, 9-6 to 10, 13 to 13-6, and 14-6 to 15, and the small group, 8 to 9. In the larger grouping by years, the boys excel excepting for the year 13 to 14, but the difference here is very small, 49.06 per cent. of the boys reaching the girls' median ability.

Differences Between Tests III A and III B

In test III A, the filling of the blanks, the appropriate term must be recalled and written, while in III B, the correct term is given, the association requiring merely a sufficient recall of meaning to enable the pupil to select it from the two. Differences in difficulty are evident in the following table of results for the two tests.

TABLE XVIII

MEDIAN ABILITY AND VARIABILITY OF TESTS IIIA AND IIIB

	Boys				Girls			
	M's		Q's		M's		Q's	
Grades	IIIA	IIIB	IIIA	IIIB	IIIA	IIIB	IIIA	IIIB
4A	11.72	15.25	2.85	1.44	11.25	15.10	3.28	1.41
5B	13.50	15.66	3.06	.99	13.21	15.68	1.74	1.12
5A	14.31	15.73	2.08	.85	13.87	15.92	1.79	1.23
6B	16.20	16.14	1.79	.78	14.95	16.18	2.06	1.01
6A	16.60	16.13	1.50	.85	16.21	16.52	1.91	.86
Averages	14.46	15.78	2.25	.98	13.89	15.88	2.15	1.12

Test III A is clearly harder throughout excepting in grade 6 A and grade 6 B for boys where it seems slightly easier. Both tests grow easier as we pass up the grades, but III A much more so proportionately than III B. By the time grade 6A is reached, the tests are practically equal in difficulty. Test III A is evidently one in which school training enters as a large factor. The percentage of those who in test III B reach or exceed the median ability of their respective groups in test III A is here given, although because of the coarseness of the scale its results are slightly misleading; they are too high.

Grades	4A	5B	5A	6B	6A	Averages
Boys	88.17	89.87	89.92	55.10	54.00	75.41
Girls	93.18	93.02	82.75	87.65	66.00	84.52

Sex Differences between the Tests

The foregoing indicates that test III B is proportionately easier for the girls than for the boys. Excepting in grade 4A, the girls are absolutely as well as relatively superior to the boys in test III B, while in test III A the boys are superior throughout, although the difference is very small. The following array of the percentage of boys who reach or exceed the ability reached by 50 per cent. of the girls impresses these differences:

Grades	4A	5B	5A	6B	6A	Averages
Test III A	54.5	51.1	54.8	63.8	57.8	56.4
Test III B	53.5	49.3	44.1	48.8	38.4	46.8

For both boys and girls, the variability is greater for test III A than for III B. Relatively, it is greater for boys in III A and for girls in III B. In both tests and for both boys and girls there is a diminution in variability as we pass from the lower to the higher grades.

Test IV

TABLE XIX

FREQUENCY OF ABILITIES BY GRADES

Grade		4A		5B		5A		6B		6A	
Ability		B	G	B	G	B	G	B	G	B	G
0 to	5	6	1	2	1						
5 "	10	5	4					1			
10 "	15	1	3			1	1	1			1
15 "	20	2	1	1				1			
20 "	25	4		1		1					
25 "	30	1	1	1	3	1	1	1			1
30 "	35	2	2			3					
35 "	40	4	1			1	3				
40 "	45	2	1	1		2		1			
45 "	50	3		1	1	3	1	1			1
50 "	55	1	2	1	1	2		3			
55 "	60	6	6	1	3	1		4	1		
60 "	65	7	4	4	2		1	2	1	1	1
65 "	70	5	4	6	5	6	3	5	2		
70 "	75	5	4	4	7	1	1	5	1	2	
75 "	80	6	11	7	5	4	3	5	1	1	1
80 "	85	3	8	9	9	7	4	6	4	1	5
85 "	90	8	8	8	9	6	6	7	7	2	3
90 "	95	9	12	8	4	6	8	8	6	8	5
95 "	100	7	8	11	14	9	7	10	18	10	8
100 "	105	3	5	5	12	9	9	18	15	11	14
105 "	110	2	2	7	9	4	6	9	14	9	14
110 "	115	1		1				3	9	5	4
115 "	120				1			3	1		1
Cases		93	88	79	86	65	58	98	81	50	59

TABLE XX

MEDIAN ABILITY AND VARIABILITY FOR EACH GRADE

Grades	M's		Higher		Q's		Co'ts. of Var.	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls.
4A	67.50	79.66	12.16	25.00	15.81		.37	.19
5B	85.50	89.00	3.50	13.00	13.50		.15	.15
5A	87.25	92.50	5.25	14.83	12.46		.16	.13
6B	95.00	99.58	4.58	12.19	7.25		.12	.07
6A	100.00	101.25	1.25	5.94	7.45		.05	.07

Combining the Half Years of Grades 5 and 6:

5	86.37	90.75	4.38	13.91	12.98		.16	.14
6	97.50	100.41	2.91	9.06	7.35		.09	.07
For all	88.93	93.00	4.07	16.05	12.24		.18	.13

Per Cent. of Each Grade Reaching the 75 Per Centile of All

Grade	4A	5B	5A	6B	6A
Boys	7.52	18.97	24.56	42.85	54.00
Girls	4.54	22.71	20.68	37.02	47.43

Here, in the opposites test, the girls diminish in ability in grade 5A and are strong, relatively, in 5B, while for test III they were weakest in grade 5B, in this selected group.

Sex Differences by Grades

Per Cent. of the Boys Reaching the 50 Per Centile of the Girls

Grade	4A	5B	5A	6B	6A
Per Cent.	35.8	43.0	43.0	41.0	44.5

This array shows plainly the superiority of the girls in *median* ability. But to tell the whole story, the preceding two arrays must be taken into account. Note that in every grade excepting 5B a *larger percentage of the boys than of the girls* reach the 75 per centile of all of each sex. Referring to the Q's in Table XX, and the array of results for the combined divisions of grades 5 and 6 immediately following, it is seen that the variability of the boys is, on the whole, much higher than that of the girls. Here the comparison of the sexes by the central tendencies for the large groups in which the girls are found to be superior to the boys conceals a sub-group as large as 25 per cent. in each large group in which the superiority is reversed in four cases of five. This enforces the necessity that, when used as bases of comparison, median values, or other central tendencies, where variability is at all great, must be checked by careful interpretation of that variability, or the comparison may be misleading and quite erroneous beyond the limits of the probable error in each array. Stress upon central tendencies to the neglect of variability may conceal sub-groups within the larger group having quite opposite central tendencies.

TABLE XXI

FREQUENCY OF ABILITIES BY AGES

Ability	Age 8–10 B	G	10–11 B	G	11–12 B	G	12–13 B	G	13–14 B	G	14–16 B	G
0 to 5		2	2		2		3		1			
5 " 10	2		2	1	1	2				1	1	
10 " 15		1	1				2	1		1		2
15 " 20	2								1	2		
20 " 25			1		1		2		2			
25 " 30				1		2	3	1		3		
30 " 35			1				2	3	1			
35 " 40					2	3	2		1	1		
40 " 45				1	2		1		1		2	
45 " 50				3	1	1		1	4			1
50 to 55					1	4	1	1	2			
55 " 60	2		1	4	4	3	2	3	2		2	1
60 " 65	1	3	3	2	3		6	3	1		1	
65 " 70			4	2	9	5	4	2	3	4	1	
70 " 75	3	3	3	3	1	3	4	3	5	1	1	
75 " 80	2	4	5	5	8	6	3	5	5			1
80 " 85	1	3	6	4	4	8	10	8	4	5	1	2
85 " 90		5	8	5	10	11	7	7	5	5	1	
90 " 95	3	6	10	9	9	6	9	10	4		4	4
95 " 100	4	5	15	13	9	12	12	12	3	12	4	1
100 " 105	2	5	10	11	12	13	19	17	1	6	2	2
105 " 110	3	4	8	11	9	9	2	15	6	4	3	1
110 " 115	1	1	1	6	9	4	3	4	1	1	1	1
115 " 120	1		1	1	1	1			1			
Cases	27	43	84	81	101	93	96	93	53	46	24	16

TABLE XXII

MEDIAN ABILITY AND VARIABILITY FOR EACH AGE

Age	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
8 to 9	12.00	93.00		81.00	4.50	47.50	.37	.51
9 " 9–6	99.00	85.00	14.00		15.00	14.00	.15	.16
9–6 " 10	84.50	91.50		7.50	13.75	9.75	.16	.10
10 " 10–6	93.50	95.50		2.00	19.50	12.50	.21	.13
10–6 " 11	93.50	95.50		2.00	10.00	12.83	.10	.13
11 " 11–6	88.75	88.00	.75		17.19	10.62	.19	.12
11–6 " 12	89.50	89.50			16.25	15.68	.18	.17
12 " 12–6	89.50	94.75		5.25	17.25	11.43	.19	.12
12–6 " 13	87.50	98.50		11.00	10.83	10.50	.12	.10
13 " 13–6	77.50	92.50		15.00	19.00	16.00	.24	.17
13–6 " 14	76.00	93.50		17.50	21.50	19.00	.28	.20
14 " 14–6	89.50	91.00		1.50	19.75	4.50	.22	.05
14–6 " 15	94.50	105.50		11.00	22.75	12.75	.33	.12
15 " 16	98.50	76.50	22.00		3.50	28.75	.03	.37

TABLE XXII—Continued

Combining Half Years, and Smaller Groups:

8 to 10	90.50	89.75	.75		19.18	11.43	.21	.12
10 " 11	93.50	95.50		2.00	11.40	11.83	.12	.12
11 " 12	89.25	88.83	.42		16.85	13.56	.18	.15
12 " 13	88.50	97.25		8.75	16.50	10.81	.18	.11
13 " 14	77.75	90.00		12.25	19.12	16.18	.24	.17
14 " 16	93.00	91.00	2.00		18.50	21.50	.19	.23

Combining Further the Extreme Groups:

8 " 10	91.83	93.00		1.17	12.56	12.50	.136	.134
13 " 16	81.50	91.00		9.50	20.81	16.18	.25	.17

Per Cent. of Each Age Group Reaching the 75 Per Centile of All

Age	8-11	11-12	12-13	13-16
Boys	29.72	32.67	27.06	19.47
Girls	24.99	25.80	31.17	19.43

The rhythm for both boys and girls, the general diminution in ability for both, the general superiority of the girls over the boys, and the greater variability of the boys are all quite evident in the foregoing distributions. In the array for the percentage of the age groups reaching the 75 per centile of all, the maximum for this selected group is found in the age period 11 to 12 for boys, and one year later for girls. After the maximum, both boys and girls decline in ability rather markedly, the percentage showing superior ability being less in the age period 13 to 16 than at any other age, and almost exactly the same for both sexes.

Comparison of Youngest and Oldest 25 Per Cents. of the A Grades

TABLE XXIII

Youngest and Oldest Pupils of Grades A Compared

Boys

Grade		Median Age Yrs.	Mo.	M's	Higher Younger	Older	Q's	Co'ts. of Var.
4A	Younger 25%	9	8.0	74.50			39.00	.52
	Older "	12	9.5	55.00	19.50		19.00	.34
	Whole Grade	11	.5	67.50			25.00	.37
5A	Younger 25%	10	2.5	93.50			13.68	.14
	Older "	13	.5	76.50	17.00		22.94	.29
	Whole Grade	11	9.2	87.25			14.83	.16
6A	Younger 25%	11	1.5	99.00			5.75	.58
	Older "	14	5.5	98.50		.50	5.25	.53
	Whole Grade	12	4.0	100.00			5.94	.05

TABLE XXIII—Continued

Girls

4A	Younger 25%	9	4.0	83.50		9.00	.17
	Older "	12	3.5	69.00	14.50	25.50	.37
	Whole Grade	10	7.8	79.66		15.81	.19
5B	Younger 25%	9	10.5	100.50		10.62	.10
	Older "	12	6.5	87.50	13.00	11.19	.13
	Whole Grade	11	4.0	92.50		12.46	.13
6A	Younger 25%	11	0.0	103.50		5.25	.05
	Older "	14	6.5	95.50	8.00	9.00	.09
	Whole Grade	12	7.5	101.25		7.45	.07

The superiority of the younger group over the older is marked in this test for every grade. But this superiority is greatest in grade 4A and progressively diminishes as we pass upward. This is in harmony with what we should expect from the array for the percentage of each age group who reach the 75 per centile of all. The marked superiority of the younger groups in the lower grades in contrast with the very greatly diminished superiority in upper grades would indicate that this test is one which clearly reveals a certain type of native ability. This ability becomes concealed in upper grades where the validity of these particular opposites as a test becomes very small because of school training and experience. With these easy opposites, we reach a point where good and poor pupils make grades about equally good. Here, the girls are superior to the boys, also, in every group excepting that of the older pupils of grade 6A. The sex difference is greater for the group of older pupils except in grade 6A. In no case does the older group of pupils reach the median ability of its grade as a whole, while all of the groups of younger pupils except that of the boys in grade 6A reach or exceed the median ability of their respective grades. In general, variability is greater for the older groups, for the lower grades, and slightly so for the boys.
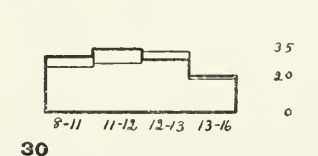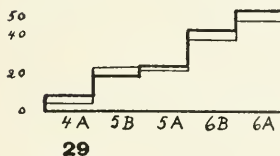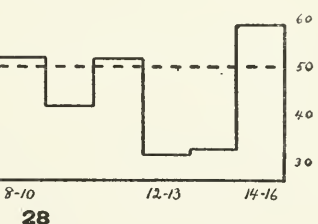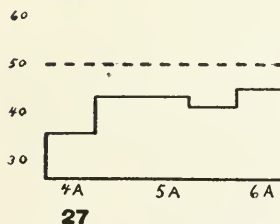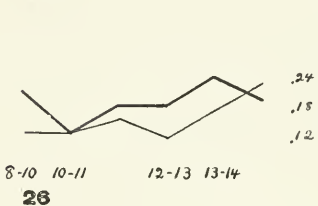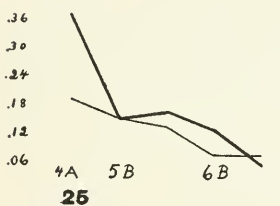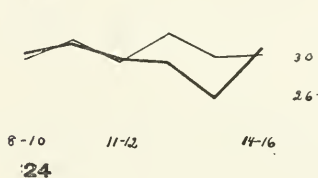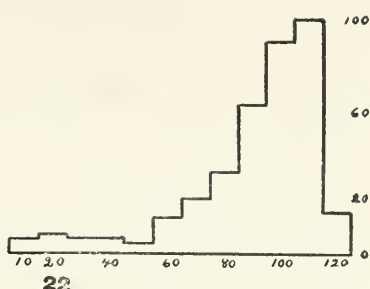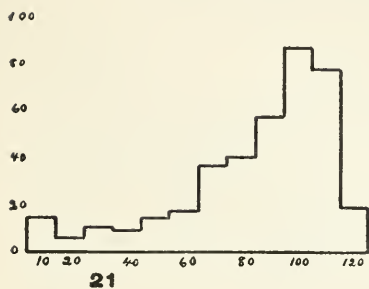
FIGURES 21–30.

TEST IV

21. Frequencies of Abilities, Boys.
23. Median Ability, by Grades.
25. Variability, by Grades.
27. Per Cent. of Boys Reaching the 50
   Per Centile of Girls, by Grades.
29. Per Cent. of Pupils Reaching the 75
   Per Centile of All, by Grades.
   ———— Boys.

22. Frequencies of Abilities, Girls.
24. Median Ability, by Age.
26. Variability, by Age.
28. Per Cent. of Boys Reaching the 50
   Per Centile of Girls, by Age.
30. Per Cent. of Pupils Reaching the 75
   Per Centile of All, by Age.
   ———— Girls.

Sex Differences by Age

TABLE XXIV

PER CENT. OF THE BOYS REACHING THE 50 PER CENTILE OF THE GIRLS

				Combining Half Years and Smaller Groups	
Age	For Half Years Per Cent.	Age	Per Cent.	Age	Per Cent.
8 to 9	00.00	12 to 12–6	42.37	8 to 10	51.85
9 " 9–6	66.66	12–6 " 13	24.32	10 " 11	41.66
9–6 " 10	38.45	13 " 13–6	28.20	11 " 12	51.48
10 " 10–6	46.87	13–6 " 14	21.43	12 " 13	31.25
10–6 " 11	38.46	14 " 14–6	46.66	13 " 14	32.08
11 " 11–6	55.55	14–6 " 15	20.00	14 " 16	58.33
11–6 " 12	52.63	15 " 16	100.00		

In but four of the fourteen respective age groups, 9 to 9-6, 11 to 11-6, 11-6 to 12, and 15 to 16, do 50 per cent. of the boys reach the median ability of the girls. These periods, it may be noted, coincide fairly closely with the crests of the rhythm observed in the several arrays of the boys' records for age distribution. From 12-6 to 14 is a period of especially low relative success for the boys—the period of especial superiority for the girls in several tests.

Summary for Controlled Association Tests

Grade Differences

In both tests III and IV, there is general progress from grade to grade in both sexes. The greatest relative progress in both tests is from grade 4A to grade 5B. In general, there is also diminishing variability in passing upward from grade 4A. Median ability and variability are shown for the respective tests in Tables XIII and XX. The gain in per cent. for test III is, from grade 4A to grade 6A, 21.13 for boys, 19.30 for girls; for test IV, 48.14 for boys, 26.97 for girls. This is a much smaller gain in median ability than was made in the mathematical tests in every case. In the selected groups from the grades of those reaching the 75 per centile of all, pages 36 and 42, test III is seen to be much easier relatively for a larger portion of the lower grade pupils than is test IV, especially so in grade 4A. In the upper grades, the percentages are very similar—exactly the same for boys in grade 6B. In both tests, the high percentage of grade 6A who reach the 75 per centile for all indicates that

both would probably be too easy to be valid as tests much beyond this grade.

Age Differences

The general statement for age differences for tests I and II holds fairly applicable for test III. Progress with age is rather irregular. A rhythm is observed for boys with crests at about 9 yrs. 6 mo., 12 yrs., and 14 yrs., each crest a little higher than the preceding. For the girls a more distinct rhythm is observed than in tests I and II. Its crests are fairly clear at 10 yrs., 12 yrs., 13 yrs. 6 mo., and 14 yrs. 6 mo., almost coincident with the rhythm of the boys at 12 yrs., but not so in earlier or later years. In the condensed form of age distribution immediately following Table XV, the very small changes with age are apparent. The group of boys from 13 yrs. up is very little superior to that of from 8 to 11 yrs., while the oldest group of girls is slightly below the youngest group in median ability. Reference to Table XVI indicates further these differences of groups within the grades. These small differences appearing in the age distributions in contrast with the more definite increase from grade to grade suggest that school training rather than life experience or native difference in capacity is a large factor in determining success in the test. In general, a pupil who is 14 does almost no better than one who is 11, but one who has been to school six years does better than one who has been to school but four years.

In test IV, there is a marked rhythm in the age distribution, but with a general diminution in ability for boys, taking results as a whole, and very little increase for girls. In the results for boys, Table XXII, crests of the rhythm appear at 9 yrs., 10 yrs. 6 mo., 12 yrs., and 14 yrs. 6 mo. But the second and third crests are lower than the first; the third is lower than the second; and the fourth is no higher than the first. In the closer distribution into four groups, there is diminution from group to group, the lowest result for boys being for the year 13 to 14. For the girls, the rhythm shows crests at 9 yrs., 10 yrs. 6 mo., 12 yrs. 6 mo., 13 yrs. 6 mo., and 14 yrs. 6 mo. The closer distribution, combining half years and smaller groups, shows this rhythm more central in the groups at 10 yrs. 6 mo., 12 yrs. 6 mo., and 14 yrs. 6 mo., intervals of two years. The grade for the year

12 to 13 is especially high, exceeded only by the small group from
14 yrs. to 14 yrs. 6 mo. The parallelism of the rhythm for girls
in this test and test III is quite marked as it is also for boys
from 12 years. But in test III, up to 14 years, the boys are best
from 11 to 12, in test IV from 10 to 11. Girls are best in both
from 12 to 13. In variability, the older children of both sexes
are slightly higher in test III, the younger in test IV.

Sex Differences

By the grade distribution, the boys are superior to the girls
in median ability in every grade except 4A, in test III, as is
shown in Table XIII; and for test IV, as seen in Table XX,
the girls are superior in every grade and most so in grade 4A.
By the age distribution, practically the same results are in evi-
dence, Tables XV and XXII. The arrays showing the percent-
age of boys who reach or exceed the median ability of the girls,
pages 36 and 43, for the grade distribution, and Tables XVII and
XXIV for the age distribution, indicate this more definitely.

In variability, the Q's of the girls are higher than those of the
boys in 9 of the 14 half year groups for test III, Table XV,
while for test IV, Table XXII, the boys are higher in 11 of the
14 half year groups. In grade distribution, the girls have a
higher variability than the boys in 3 of the 5 grades in test III,
Table XIII, while in test IV, Table XX, the variability of the
boys is higher in 4 of the 5 grades. This variability asserts
itself here in an interesting way. While it is true that in median
ability 4 of the 5 grades show the boys to be superior to the girls
in test III, reference to the array giving the percentage from
each grade who reach the 75 per centile of all, page 36, will
show that in all of these grades but 5B a larger percentage of
girls than of boys is found in this highest quartile of ability.
Similarly for test IV, although in all of the 5 grades the median
ability of the girls is higher, in all of them but 5B there is a
larger percentage of *boys* than of girls who are in the highest
quartile of ability. This but intensifies the unreliability of the
central tendency of a large group as a valid index of the
quality of the group measured unless it is checked by an adequate
interpretation of the variability of the group. As social capital
and as social problems, the most important individuals or sub-

groups of individuals in large groups may often lie beyond the limits of the probable error. The greater the variability the more important is its adequate interpretation.

Selective Judgment—Tests V and VI

The two tests, V and VI, in selective judgment are treated separately throughout. Though the tests in selecting good reasons from among those given to account for the stated conditions seem very much like those in selecting good definitions from among those given for certain terms, and though many resemblances are shown in the results, a number of differences are also evident in the arrays of summaries.

Test V

TABLE XXV

Frequency of Abilities by Grades

Ability	Grade 4A B	4A G	5B B	5B G	5A B	5A G	6B B	6B G	6A B	6A G
−20 to −18	1									
−18 " −16										
−16 " −14										
−14 " −12	1		1		1			1		
−12 " −10		1	1		1		1	2		
−10 " −8	1	4		3	2	1		1		
−8 " −6	1	5	2	4	3	4				
−6 " −4	1	3	3	3		3				
−4 " −2	17	9	3	6	4		4	1	2	
−2 " 0	9	11	7	7	4	4	6	1		2
0 " 2	13	10	6	10	4	4	3	6	3	1
2 " 4	8	13	8	10	6	3	6	6	1	
4 " 6	6	9	9	4	4	1	2	1	2	4
6 " 8	8	5	2	6	2	2	6	2	1	1
8 " 10	6	2	2	4	2	2	1	3	2	
10 " 12	3	3	2	6	4	3	2	6	1	3
12 " 14	2	1	4	2	2	2	1	3	2	
14 " 16	3	2	1	4	1	2	7	3		
16 " 18	1		1		5	3	5	4	5	5
18 " 20	2	2		2	4	4		4	2	4
20 " 22			1	1	2	3	6	2	5	3
22 " 24	3	4	3	2	3	1	8	4	3	6
24 " 26		2	4	2	3	6	11	5	4	4
26 " 28	2		7	2	1	3	6	8	5	7
28 " 30	2	1	6	4	4	2	7	9	8	8
30 " 32	2		4	2	3	2	6	5	2	6
32 " 34	1	1		1		2	6	2	2	3
34 " 36			1	1		1	3	1		2
36 " 38			1							
Cases	93	88	79	86	65	58	98	81	50	59

TABLE XXVI

Median Ability and Variability for Each Grade

Grade	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
4A	2.62	2.11	.51		5.57	4.12	2.12	1.95
5B	5.90	4.00	1.90		12.28	6.83	2.08	1.70
5A	9.75	14.00		4.25	9.41	11.25	.96	.80
6B	21.50	17.50	4.00		10.31	10.53	.47	.60
6A	23.00	24.16		1.16	7.29	5.94	.31	.24

Combining the Half Years of Grades 5 and 6:

Grade	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
5	7.82	9.00		1.18	10.84	9.04	1.38	1.00
6	22.25	20.83	1.42		8.80	8.23	.396	.395
For all	10.93	8.14	2.79		11.79	11.51	1.07	1.41

Per Cent. of Each Grade Reaching the 75 Per Centile of All

Grade	4A	5B	5A	6B	6A
Boys	7.52	29.09	16.91	39.79	42.00
Girls	7.95	13.94	17.58	39.48	55.90

In this test, the large proportion of boys of grade 5B in the selected group is noticeable. In the two B grades, the boys are superior in numbers for this highest quartile while the girls are highest in the three A grades.

Sex Differences by Grades

Per Cent. of Boys Reaching the 50 Per Centile of the Girls

Grade	4A	5B	5A	6B	6A
Per Cent.	52.2	60.7	38.1	55.1	47.6

Here, as in the selected group above, the relative superiority of the boys is greatest in grade 5B. In grades 5A and 6A, the girls are superior.

TABLE XXVII

FREQUENCY OF ABILITIES BY AGES

Ability	Age 8–10 B	8–10 G	10–11 B	10–11 G	11–12 B	11–12 G	12–13 B	12–13 G	13–14 B	13–14 G	14–16 B	14–16 G
−20 to −18			1									
−18 " −16												
−16 " −14												
−14 " −12	1				1				1		1	
−12 " −10				1							1	1
−10 " −8			2	1	4	1	2	1	1			
−8 " −6	1		2	1	3	1	5	3	2		2	
−6 " −4			2	1	4	3	1		2	1	1	
−4 " −2	3	7	13	4	6	3	3	4	4		1	
−2 " 0	1	3	4	6	4	7	10	4	8	2		1
0 " 2	3	4	4	9	9	7	6	7	2	4	4	1
2 " 4	1	3	6	5	6	7	7	11	8	5	1	1
4 " 6	1	2	4	2	6	6	8	4	2	4	2	
6 " 8		2	5	2	7	2	5	5	1	3	1	2
8 " 10	3		3	3	1	4	2	3	1		1	
10 " 12		3	3	5	3	4	2	3	4	5	1	1
12 " 14			3	1	4	2		3	1	1	1	1
14 " 16	1		2	2	3	5	7	2	1		1	1
16 " 18	1		3	2	5	3	3	4	2			
18 " 20		3	3	2	4	3	3	3	1	4		1
20 " 22					1	2	2	4	3	4	4	
22 " 24	2		1		7	3	4	7	2	5	4	3
24 " 26	2	2	5	5	5	4	8	4	1	2	1	1
26 " 28	2	1	3	4	7	4	3	8	3	2	2	1
28 " 30	2	2	6	4	6	7	6	7	3	2	1	2
30 " 32	2	1	5	3	8	4	7		4	2	3	
32 " 34	1	1	1	1	4	3	2	2	2		1	
34 " 36			3		1	2	2		3			
36 " 38					1							
Cases	27	43	84	81	101	93	96	93	53	46	24	16

TABLE XXVIII

MEDIAN ABILITY AND VARIABILITY FOR EACH AGE

Age	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
8 to 9	3.50	10.00		6.50	5.50	16.50	1.57	1.65
9 " 9–6	9.50	1.50	8.00		12.50	9.16	1.31	6.10
9–6 " 10	17.50	5.00	12.00		13.25	8.68	.75	1.73
10 " 10–6	9.00	6.50	2.50		15.00	11.00	1.66	1.69
10–6 " 11	7.50	9.25		1.75	9.66	12.72	1.28	1.37
11 " 11–6	9.50	12.00		2.50	11.46	11.87	1.20	.98
11–6 " 12	16.00	10.75	5.25		11.75	12.16	.73	1.13
12 " 12–6	14.50	16.50		2.00	11.70	12.92	.80	.77
12–6 " 13	14.25	7.00	7.25		10.24	8.94	.71	1.27
13 " 13–6	7.50	9.00		1.50	11.85	8.54	1.58	.94
13–6 " 14	11.00	10.50	.50		10.00	13.50	.90	1.28
14 " 14–6	7.50	11.50		4.00	11.75	4.00	1.56	.34
14–6 " 15	15.50	26.50		11.00	5.25	14.75	.34	.55
15 " 16	6.50	22.50		16.00	17.00	7.93	2.61	.35

TABLE XXVIII—Continued

Combining Half Years, and Smaller Groups:

8 " 10	9.83	2.16	7.67		12.87	8.91	1.30	4.1
10 " 11	8.00	8.50		.50	12.66	11.89	1.58	1.31
11 " 12	12.37	11.25	1.12		12.25	11.94	.99	1.06
12 " 13	14.33	11.50	2.83		11.26	12.00	.78	1.04
13 " 14	9.50	10.33		.83	10.73	8.25	1.12	.79
14 " 16	10.50	17.00		6.50	11.00	8.50	1.04	.50

Combining Further the Extreme Groups:

| 8 " 11 | 9.30 | 5.00 | 4.30 | | 12.58 | 11.90 | 1.35 | 2.38 |
| 13 " 16 | 9.75 | 11.00 | | 1.25 | 10.82 | 10.44 | 1.10 | .95 |

Per Cent. of Each Age Group Reaching the 75 Per Centile of All

Age	8-11	11-12	12-13	13-16
Boys	28.82	31.68	28.10	20.76
Girls	17.74	27.95	32.25	30.62

The foregoing arrays indicate rhythms of ability for both boys and girls; the maximal ability for boys in the year 12 to 13; a high plateau for girls from 11 to 12-6, then a decline, then a maximal high plateau from 14 to 16; high variability for both boys and girls; for the higher quartile of ability, a maximum of boys from 11 to 12, of girls from 12 to 13; a larger percentage of boys in the higher quartile up to 12 years, of girls from 12 upward, and smaller percentages for both from 13 to 16 than from 12 to 13; and suggests, in connection with Table XXVI, that this test is a measure of both native ability and school training. Progress through the grades makes for better results; having good ability, though young, makes for good results; but merely growing older does not make for better results.

Comparison of Youngest and Oldest 25 Per Cents. of the A Grades

TABLE XXIX

YOUNGEST AND OLDEST PUPILS OF THE A GRADES COMPARED

| | | Median Age | | Boys | Higher | | | Co'ts. |
Grade		Yrs.	Mo.	M's	Younger	Older	Q's	of Var.
4A	Younger 25%	9	8.0	2.50			7.12	2.84
	Older "	12	9.5	2.50			4.00	1.60
	Whole Grade	11	.5	2.62			5.11	2.12
5A	Younger 25%	10	2.5	7.75			12.18	1.57
	Older "	13	.5	9.75		2.0	10.25	1.05
	Whole Grade	11	9.2	9.75			9.41	.96
6A	Younger 25%	11	1.5	28.50			6.33	.22
	Older "	14	5.5	18.00	10.50		8.50	.47
	Whole Grade	12	4.0	23.00			7.29	.31

TABLE XXIX—Continued

Girls

4A	Younger 25%	9	4.0	.50		7.54	15.08
	Older "	12	3.5	2.00	1.50	2.56	1.28
	Whole Grade	10	7.8	2.11		4.12	1.95
5A	Younger 25%	9	10.5	16.50		9.93	.60
	Older "	12	6.5	13.75	2.75	11.75	.85
	Whole Grade	11	4.0	14.00		11.25	.80
6A	Younger 25%	11	0.0	27.66		3.50	.12
	Older "	14	6.5	25.50	2.16	4.50	.17
	Whole Grade	12	7.5	24.16		5.94	.24

The younger groups here exceed the older in grade 6A for boys, and grades 5A and 6A for girls; for grade 4A the two groups are equal for boys; and in grade 5A for boys and 4A for girls the older groups are superior. In grade 4A not one of the four groups reaches the median of ability for the whole grade; in grade 5A, the older boys and the younger girls reach the respective grade medians; and in grade 6A the younger boys and both groups of girls reach higher medians than the grade as a whole. In grade 4A for girls, and 5A for boys, the younger groups are more variable; for the others, the older groups vary most. Here it is true that in every case where the *younger* group is superior in median ability the *older* group is higher in variability. This array tends to isolate groups on the basis of native ability, and also tends to establish a generalization to the effect that the higher the ability in a given test for a group in these school grades the lower the variability of the group for that test.

Sex Differences by Age

TABLE XXX

Per Cent. of Boys Reaching the 50 Per Centile of the Girls

For Half Years				Combining Half Years and Smaller Groups	
Age	Per Cent.	Age	Per Cent.	Age	Per Cent.
8 to 9	50.00	12 to 12–6	45.76	8 to 10	66.66
9 " 9–6	91.75	12–6 " 13	59.45	10 " 11	45.23
9–6 " 10	61.53	13 " 13–6	48.72	11 " 12	52.47
10 " 10–6	56.25	13–6 " 14	57.14	12 " 13	51.04
10–6 " 11	48.07	14 " 14–6	40.00	13 " 14	49.06
11 " 11–6	46.03	14–6 " 15	20.00	14 " 16	37.50
11–6 " 12	65.78	15 " 16	25.00		

In 7 of the 14 half year groups, fewer than half of the boys reach the median ability of the girls. These groups so alter-
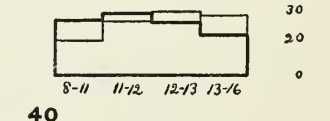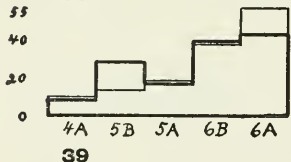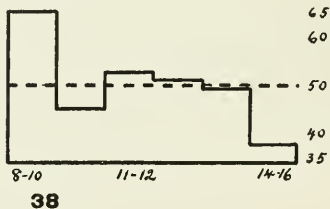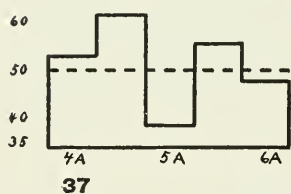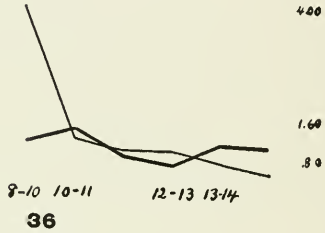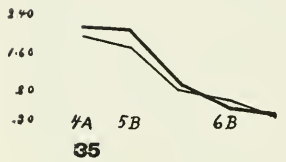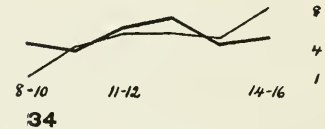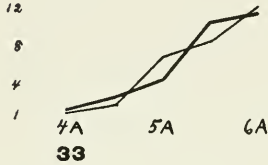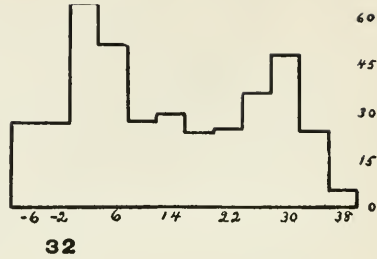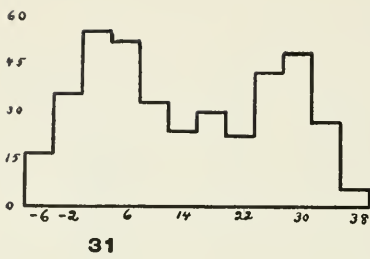
FIGURES 31–40.
TEST V

31. Frequencies of Abilities, Boys.
33. Median Ability, by Grades.
35. Variability, by Grades.
37. Per Cent. of Boys Reaching the 50
    Per Centile of Girls, by Grades.
39. Per Cent. of Pupils Reaching the 75
    Per Centile of All, by Grades.
——————— Boys.

32. Frequencies of Abilities, Girls.
34. Median Ability, by Age.
36. Variability, by Age.
38. Per Cent. of Boys Reaching the 50
    Per Centile of Girls, by Age.
40. Per Cent. of Pupils Reaching the 75
    Per Centile of All, by Age.
——————— Girls

nate that a distinct rhythm is observed, showing the relative ability of the boys to diminish progressively with age, the second crest and the second valley both being lower than the first crest and valley, respectively.

Test VI

TABLE XXXI

FREQUENCY OF ABILITIES BY GRADES

Grade Ability	4A B	4A G	5B B	5B G	5A B	5A G	6B B	6B G	6A B	6A G
−24 to −22				1						
−22 " −20										
−20 " −18			1	1						1
−18 " −16	1	3								
−16 " −14	1				1					
−14 " −12	1	1				1				
−12 " −10	2	2		1						
−10 " −8	4	1	1	1	2		1	1		
−8 " −6	2	6	2	1	1	2				
−6 " −4	2	4	2	4	1	3	1			1
−4 " −2	8	5	3	4	4	3		1	3	1
−2 " 0	15	12	7	16	3	4	3	3		
0 " 2	6	4	6	8	8	3	5	1	3	3
2 " 4	10	8	8	11	6	7	4	4	2	
4 " 6	8	7	3	4	4	6	7	3	4	1
6 " 8	2	8	8	5	3	6	6	5	4	1
8 " 10	6	7	6	6	6	5	4	5	2	1
10 " 12	5	6	7	2	2	1	5	5	5	5
12 " 14	2	2	5	3	4	1	4	6	2	8
14 " 16	2	3	2	6	4	3	5	7	1	5
16 " 18	5	4	3	2	6		14	7	1	5
18 " 20	3	1	1	2	3	2	5	5	1	6
20 " 22	2			2	2	5	7	8	4	6
22 " 24		1	4	2	1		2	4	1	1
24 " 26	2		4	1	2		7	3	3	1
26 " 28	1		2		1	1	1	3	3	4
28 " 30	1	1	2			1	5	4	2	1
30 " 32				1	1	1	5	2	1	3
32 " 34	1	1					1	1	6	3
34 " 36	1			2		2	2	1	1	
36 " 38							1	1		1
38 " 40		1				1	1	1	1	
40 " 42							1			1
42 " 44							1			
44 " 46							1			
Cases	93	88	79	86	65	58	98	81	50	59

TABLE XXXII

MEDIAN ABILITY AND VARIABILITY FOR EACH GRADE

	M's		Higher		Q's		Co'ts. of Var.	
Grade	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
4A	2.90	3.33		.43	6.77	5.80	2.33	1.74
5B	7.50	3.28	4.22		6.29	6.06	.83	1.84
5A	7.50	6.00	1.50		6.84	7.25	.91	1.20
6B	16.50	15.75	.75		8.33	6.23	.50	.38
6A	14.00	17.37		3.37	10.37	5.05	.74	.29

Combining the Half Years of Grades 5 and 6:

5	7.50	4.64	2.86		6.56	6.65	.87	1.43
6	15.25	16.56		1.31	9.35	5.64	.61	.34
For all	8.90	9.00		.10	8.11	7.84	.91	.87

Per Cent. of Each Grade Reaching the 75 Per Centile of All

Grade	4A	5B	5A	6B	6A
Boys	15.05	22.77	24.56	54.08	48.00
Girls	10.22	17.66	24.13	53.06	57.59

Here it will be noted that the maximum percentage of boys in the highest quartile is in grade 6B, of girls in grade 6A. For both sexes there is progress made from grade to grade excepting from 6B to 6A for boys where there is a loss.

Sex Differences by Grades

Per Cent. of the Boys Reaching the 50 Per Centile of the Girls

Grade	4A	5B	5A	6B	6A
Per Cent.	47.6	65.5	53.8	54.5	46.0

In median ability, the boys are superior to the girls except in grades 4A and 6A. In the higher quartile this superiority extends to grade 4A, also. Excepting in grade 5A, the variability of the boys is also greater than that of the girls, as shown by Table XXXII.

In median ability as well as in ability in the highest quartile, the boys reach their maximum in grade 6B, the girls in 6A. Both boys and girls make a very marked advance from grade 5A to 6B. Boys are at a stand-still from grade 5B to 5A in median ability, and the girls lose in median ability from grade 4A to 5B, though in the highest quartile both gain for these respective periods.

TABLE XXXIII

Frequency of Abilities by Ages

Ability	Age 8–10 B	G	10–11 B	G	11–12 B	G	12–13 B	G	13–14 B	G	14–16 B	G
−24 to −22								1				
−22 " −20												
−20 " −18							1	1		1		
−18 " −16		1			1	1		1				
−16 " −14			1				1					
−14 " −12		1			1			1				
−12 " −10		1	1	2							1	
−10 " −8	2	1	1		1			1	3	1	1	
−8 " −6		2		3	2	3	2	1	1			
−6 " −4		5	2	1		4	2	4	2	1		
−4 " −2	2		4	1	5	5	3	3	3	1	1	1
−2 " 0	3	5	10	13	5	7	8	7	3	3		
0 " 2	4	3	4	5	7	5	6	4	4		2	2
2 " 4	4	3	10	10	8	2	3	7	4	5	1	3
4 " 6		4	5	4	6	7	8	3	3	2	4	1
6 " 8		4	2	8	6	5	10	5	4	2	1	1
8 " 10	1	4	5	3	8	9	8	4	1	4	1	
10 " 12	1	3	6	5	3	4	4	4	6	3	4	
12 " 14	1		4	1	5	7	4	7	2	2	1	3
14 " 16			6	4	4	7	2	9	2	3		1
16 " 18	2	2	4	3	11	4	9	5	2	4	1	
18 " 20			3	2	4	3	2	6	2	4	2	1
20 " 22	1	1	3	4	6	5	4	8	2	3		
22 " 24	2	1	1	1	3	3	2	2		2		
24 " 26			5		5	1	5	1	2	2	1	1
26 " 28			1	2	2	4	3	1	3			1
28 " 30	1		4	2	2	1	2	2	1	2		
30 " 32	1		1	3	2	2	1		1		1	1
32 " 34	1	1		1	1	1	5	2			1	
34 " 36	1	1	1	2	1	2			1			
36 " 38					1			2				
38 " 40						1	1	1		1		
40 " 42				1							1	
42 " 44					1							
44 " 46									1			
Cases	27	43	84	81	101	93	96	93	53	46	24	16

TABLE XXXIV

MEDIAN ABILITY AND VARIABILITY FOR EACH AGE

Age		M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
8 to 9		7.50	6.50	1.00		9.50	5.00	1.26	.76
9 " 9–6		7.50	1.50	6.00		13.70	5.50	1.82	.36
9–6 " 10		2.50	4.25		1.75	8.25	5.18	3.30	1.21
10 " 10–6		8.50	4.50	4.00		7.53	9.56	.88	2.12
10–6 " 11		9.50	7.37	2.13		8.16	7.31	.86	.99
11 " 11–6		10.50	9.75	.75		8.65	7.00	.82	.71
11–6 " 12		10.00	9.50	.50		7.50	9.68	.75	1.02
12 " 12–6		9.87	12.12		2.25	7.25	10.35	.73	.85
12–6 " 13		7.50	11.50		4.00	8.25	8.44	1.10	.73
13 " 13–6		9.50	14.00		4.50	8.75	7.55	.92	.54
13–6 " 14		6.50	10.50		4.00	8.00	9.50	1.23	.90
14 " 14–6		11.25	2.50	8.75		6.68	7.50	.59	3.00
14–6 " 15		4.75	12.50		7.75	2.44	14.25	.51	1.14
15 " 16		7.50	12.50		5.00	20.00	6.25	2.66	.50

Combining Half Years and Smaller Groups:

Age		M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
8 to 10		3.50	3.50			10.18	6.81	2.90	1.94
10 " 11		8.66	6.75	1.91		7.83	7.31	.90	1.08
11 " 12		10.25	9.70	.55		8.38	8.53	.81	.88
12 " 13		9.00	11.83		2.83	7.50	9.17	.83	.77
13 " 14		7.83	12.00		4.17	8.56	7.71	1.09	.64
14 " 16		10.00	10.00			7.00	7.83	.70	.78

Combining Further the Extreme Groups:

Age		M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
8 to 11		8.12	5.25	2.87		8.12	6.77	1.00	1.29
13 " 16		8.25	12.00		3.75	8.31	7.83	1.00	.65

Per Cent. of Each Age Group Reaching the 75 Per Centile of All

Age	8-11	11-12	12-13	13-16
Boys	25.22	35.64	29.14	22.06
Girls	21.77	29.02	32.25	35.46

In the highest quartile, the girls progress with age throughout and are superior to the boys from 12 years upward; the boys reach their maximum in this quartile at 12, then decline to a lower percentage from 13 to 16 than from 8 to 11. In median ability, the rhythm is marked and corresponds closely to that noted in the mathematics tests. For the girls there is a less distinct rhythm and also a general rise to a maximum in median ability at 13 yrs. 6 mo., then a slight diminution. The variability is slightly greater for the younger groups.
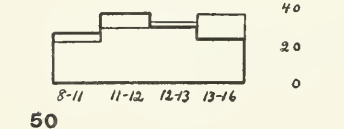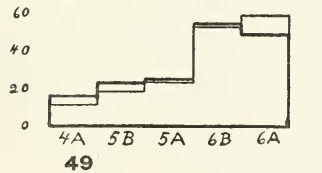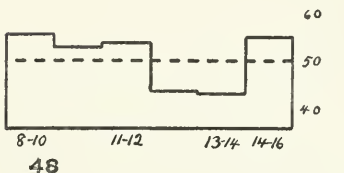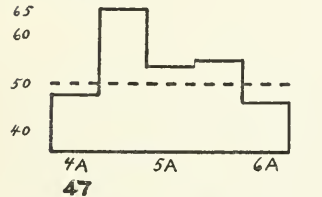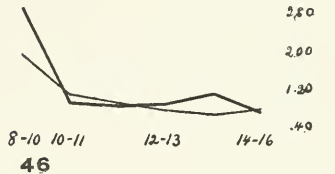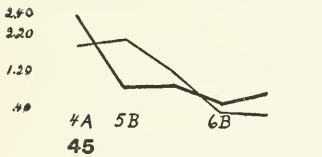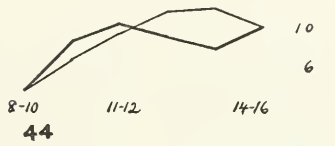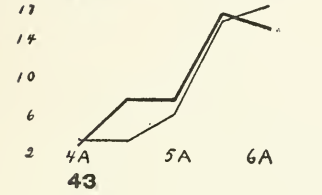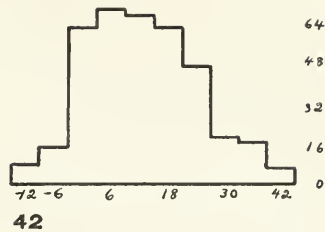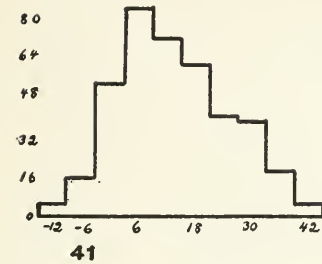
FIGURES 41–50.

TEST IV

41. Frequencies of Abilities, Boys.
43. Median Ability, by Grades.
45. Variability, by Grades.
47. Per Cent. of Boys Reaching the 50
    Per Centile of Girls, by Grades.
49. Per Cent. of Pupils Reaching the 75
    Per Centile of All, by Grades.
    ———————— Boys.

42. Frequencies of Abilities, Girls.
44. Median Ability, by Age.
46. Variability, by Age.
48. Per Cent. of Boys Reaching the 50
    Per Centile of Girls, by Age.
50. Per Cent. of Pupils Reaching the 75
    Per Centile of All, by Age.
    ———————— Girls.

Comparison of Youngest and Oldest 25 Per Cents. of the A Grades

TABLE XXXV

YOUNGEST AND OLDEST PUPILS OF GRADES A COMPARED

| | | Median Age | | Boys M's | Higher Younger | Older | Q's | Co'ts. of Var. |
Grade		Yrs.	Mo.					
4A	Younger 25%	9	8.0	−.25			7.25	29.00
	Older "	12	9.5	.66		.91	5.83	8.83
	Whole Grade	11	.5	2.90			6.77	2.33
5A	Younger 25%	10	2.5	8.25			6.94	.84
	Older "	13	.5	2.75	5.50		9.18	3.33
	Whole Grade	11	9.2	7.50			6.84	.91
6A	Younger 25%	11	1.5	14.50			9.75	.67
	Older "	14	5.5	11.50	3.00		9.00	.78
	Whole Grade	12	4.0	14.00			10.37	.74
				Girls				
4A	Younger 25%	9	4.0	4.50			5.62	1.24
	Older "	12	3.5	−.66	5.16		4.12	.62
	Whole Grade	10	7.8	3.33			5.80	1.74
5A	Younger 25%	9	10.5	7.25			8.25	1.13
	Older "	12	6.5	3.83	3.42		5.94	1.55
	Whole Grade	11	4.0	6.00			7.25	1.20
6A	Younger 25%	11	0.0	14.50			10.00	.68
	Older "	14	6.5	12.50	2.00		9.75	.78
	Whole Grade	12	7.5	17.37			5.05	.29

In every case excepting for the boys in grade 4A, the younger groups reach a higher median ability than the older. From the younger groups, the boys of grades 5A and 6A, and the girls of 5A, reach a higher median than that for their whole respective grades, while none of the older groups do this. The variability is greater for the older group in every case but that of the boys for grade 4A.

Sex Differences by Age

TABLE XXXVI

Per Cent. of Boys Reaching the 50 Per Centile of the Girls

Age	For Half Years Per Cent.	Age.	Per Cent.	Combining Half Years and Smaller Groups Age	Per Cent.
8 to 9	50.00	12 to 12–6	42.37	8 to 10	55.55
9 " 9–6	91.75	12–6 " 13	40.54	10 " 11	52.37
9–6 " 10	38.45	13 " 13–6	35.89	11 " 12	53.46
10 " 10–6	56.25	13–6 " 14	42.85	12 " 13	43.75
10–6 " 11	53.84	14 " 14–6	80.00	13 " 14	43.40
11 " 11–6	50.79	14–6 " 15	20.00	14 " 16	54.16
11–6 " 12	57.89	15 " 16	25.00		

In 7 of the 14 groups, half or more of the boys reach or exceed the median ability of the respective groups of girls. The groups in which the boys are superior are all below 12 years but one. In general, for the younger pupils the boys are superior, for the older the girls, the dividing line being, for these groups, at about 12 years. However, the relative superiority of the sexes so alternates in the groups as to emphasize the rhythm already mentioned in this test for both sexes.

Summary for Selective Judgment Tests

Grade Differences

Reference to Tables XXVI and XXXII shows very marked progress in median ability from grade 4A to 6A, in test V a gain of 777.86 per cent. for the boys, 1045.02 per cent. for the girls, and in test VI a gain of 382.75 per cent. for the boys, 421.62 per cent. for the girls, the girls making larger gains in both tests. In both tests, there is a striking advance in ability from grade 5A to 6B excepting in girls for test V where the corresponding advance is from 5B to 5A. In test VI there is not always progress from grade to grade. For boys, the median ability is the same in grades 5B and 5A, and less in 6A than in 6B, while for girls there is a slight loss from grade 4A to 5B. That test V is more difficult than test VI is evidenced by the per cent. of each grade who reach the 75 per centile for all in the respective tests; in every grade for both sexes, the percentage reaching the 75 per centile is higher for test VI excepting for the boys of grade 5B. The variability, on the whole, is slightly higher in test V. Both of these tests are measures of acquired information and training as well as of native ability as is evi-

denced by the marked progress from grade 4A to 6A in contrast with the much smaller advance from 9 to 14 in age.

Age Differences

The progress from younger pupils to older, though considerable, is not so marked as from lower grades to higher. The maximum of median ability, save for very small groups at the higher age extreme, is at about 12 years for boys, 12 yrs. 6 mo. for girls, in test V, and at about 11 yrs. 6 mo. for boys, and 13 yrs. for girls, in test VI. In both tests and for both boys and girls, a rhythm is very evident in the age distributions. While only a larger parallelism is noted in the two arrays for boys, the arrays for girls are parallel in much greater detail and both correspond closely to the array for girls in the mathematics tests. In general, it may be said that there is increased ability with age up to about 12 years for boys and 12 yrs. 6 mo. for girls, then a slight decrease until 14 for both. In the arrays for those of each age group reaching the 75 per centile of all, pages 54 and 60, the highest percentage of boys is seen to be in the group from 11 to 12, the lowest from 13 to 16, in both tests; for girls, the highest percentage is in the group from 12 to 13 for test V and from 13 to 16 in test VI, while it is lowest from 8 to 11 in both tests. A comparison of these arrays with those for the per cents. of each grade reaching the 75 per centile for these tests, pages 52 and 58, will impress how clearly the tests isolate native ability or successful school training. Forty-two per cent. of the boys of grade 6A reach the 75 per centile for test V, but only 20.75 per cent. of the boys who are from 13 to 16 do so. These percentages are computed on the same number of boys—all of those who took the test. In the comparison of the youngest and oldest 25 per cents. of the three A grades, in all of the grades for both tests, excepting 4A for test V, the younger group of girls exceeds the median ability of the older; in all but grade 4A and 5A in test V, and 4A in test VI, the younger boys exceed the median ability of the older, and in grade 4A for test V they reach it.

Sex Differences

As shown by the arrays on pages 52 and 58, in both tests over 60 per cent. of the boys reach or exceed the median ability of the girls in grade 5B and about 55 per cent. in grade 6B, while

in grade 6A in both tests the percentage is but about 47. In grade 4A the boys are superior in test V, the girls in test VI, while in grade 5A the girls are superior in test V, the boys in test VI. In all of the grades excepting 4A, 5A, and 6A in test V, and 6A in test VI, a larger percentage of boys than of girls reaches the 75 per centile for all. In these grades in which the girls reach a higher percentage the difference is very small except in grade 6A in which, for both tests, the superiority of the girls is very marked. In general, on an age basis, the boys up to 12 years are superior, the girls from 12 years upward, for both tests. The superiority of the boys is greatest for both tests in the age period from 8 to 10 years, of the girls from 14 to 16 years in test V, and from 13 to 14 in test VI. For those reaching the 75 per centile of all, the percentage is highest for the boys in both tests from 11 to 12 years, lowest from 13 to 16 years; for girls it is highest from 12 to 13 years for test V and from 13 to 16 years in test VI, while it is lowest in both tests from 8 to 11 years. In variability, the averages for the sexes are about the same. For the girls, there is progressive diminution with age, while for the boys, variability is greater in the lowest and highest age groups.

INTELLECTUAL INTERPRETATION OF POEMS—TEST VII

TABLE XXXVII

FREQUENCY OF ABILITIES BY GRADES

Ability	Grade 4A B	G	5B B	G	5A B	G	6B B	G	6A B	G
0	23	9	16	10	15	6	11	3	5	
1	24	28	17	8	13	16	8	4	5	4
2	16	23	15	19	16	6	16	13	5	7
3	9	10	9	12	3	13	16	13	3	9
4	6	4	6	12	7	4	10	7	4	7
5	1	3	1	8	3	7	12	12	10	5
6	4	6	4	3	2	1	9	8	4	7
7	4	3	4	3	1	1	7	5	4	3
8	2		1	3	1		3	3	3	1
9	1	2	1	4	2	2	3	4	2	7
10	1		3	1	1	2	2	4	2	4
11	1		2					3		4
12				1	1				1	
13				2					1	
14										1
15	1						1	1		
16										
17									1	
18								1		
Cases	93	88	79	86	65	58	98	81	50	59

TABLE XXXVIII

<small>MEDIAN ABILITY AND VARIABILITY FOR EACH GRADE</small>

Grade	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
4A	.98	1.30	.32	1.37	1.07	1.39	.82
5B	1.43	2.50	1.07	1.58	1.62	1.10	.64
5A	1.28	2.07	.79	1.57	1.54	1.22	.74
6B	2.87	4.04	1.17	1.86	2.06	.64	.50
6A	4.30	4.50	.20	2.43	2.88	.56	.64

Combining the Half Years of Grades 5 and 6:

Grade	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
5	1.35	2.28	.93	1.57	1.58	1.16	.69
6	3.58	4.27	.69	2.14	2.47	.59	.57
For all	1.83	2.46	.63	1.97	1.92	1.07	.77

Per Cent. of Each Grade Reaching the 75 Per Centile of All

Grade	4A	5B	5A	6B	6A
Boys	16.12	20.24	16.91	37.75	56.00
Girls	15.90	31.55	22.41	50.59	54.20

In this selected group, the same rise from grade 4A to 5B and fall from 5B to 5A as seen in the median ability for the grades is noted for both boys and girls. Both advance through grades 6B and 6A.

Sex Differences by Grades

Per Cent. of Boys Reaching the 50 Per Centile of the Girls

Grade	4A	5B	5A	6B	6A
Per Cent.	44.30	37.50	31.90	37.20	46.00

In every grade the girls are superior to the boys in median ability. The boys make their highest percentages in grades 6A and 4A, in order. In the percentages of each grade who reach the 75 per centile of all, the boys exceed the girls in grades 4A and 6A but in none of the others. The greatest sex difference in median ability is in grade 5A, the smallest in grade 6A.

TABLE XXXIX

Frequency of Abilities by Ages

Ability	8–10 B	8–10 G	10–11 B	10–11 G	11–12 B	11–12 G	12–13 B	12–13 G	13–14 B	13–14 G	14–16 B	14–16 G
0	8	10	14	7	19	9	12	5	13	1	3	2
1	6	8	13	18	12	16	21	8	11	5	3	2
2	2	7	19	15	16	15	19	18	11	13	3	1
3	2	3	6	12	14	16	10	19	5	5	4	1
4	1	3	10	6	13	11	5	7	3	5	1	1
5	1	3	6	6	8	6	4	9	5	7	3	3
6		5	4	4	3	3	11	6	2	3	3	4
7	2	1	2	2	7	5	8	5		1	1	
8	1	1	2	2	3	2	2	1		1	1	
9	2		1	4	1	5	2	6	2	2	1	2
10	2	1	4	1	3	1		7		1		
11		1	1	1	1	3	1	2		1		
12				1					1			
13						2					1	
14										1		
15				1	1	1						
16												
17							1					
18				1								
Cases	27	43	84	81	101	93	96	93	53	46	24	16

TABLE XL

Median Ability and Variability for Each Age

Age	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
8 to 9	5.50	3.00	2.50		3.00	4.50	.54	1.50
9 " 9–6	3.00	2.00	1.00		3.33	2.66	1.11	1.33
9–6 " 10	.16	1.50		1.34	.60	2.06	3.75	1.37
10 " 10–6	1.50	1.50			2.02	1.72	1.34	1.14
10–6 " 11	1.92	2.45		.53	1.57	1.83	.81	.74
11 " 11–6	2.07	2.55		.48	1.83	1.61	.88	.63
11–6 " 12	2.42	2.21	.21		1.24	1.98	.51	.89
12 " 12–6	1.86	2.86	1.00		2.22	1.97	1.19	.68
12–6 " 13	1.68	2.75	1.07		2.28	2.25	1.36	.81
13 " 13–6	1.08	3.00	1.92		1.91	1.76	1.77	.58
13–6 " 14	1.40	2.66	1.26		1.12	1.50	.80	.56
14 " 14–6	2.50	4.00	1.50		2.12	2.37	.93	.59
14–6 " 15	1.75	5.25	3.50		2.44	.43	1.39	.08
15 " 16	6.50	2.50	4.00		2.50	4.68	.38	1.87

Combining Half Years, and Smaller Groups:

Age	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
8 " 10	.91	1.50	.59		2.64	2.16	2.90	1.44
10 " 11	1.79	2.04	.25		1.81	1.86	1.01	.91
11 " 12	2.25	2.41	.16		1.84	1.78	.81	.73
12 " 13	1.79	2.81	1.02		2.26	2.03	1.26	.72
13 " 14	1.22	2.80	1.58		1.46	1.68	1.19	.60
14 " 16	2.75	4.33	1.58		2.16	2.00	.78	.46

Combining Further the Extreme Groups:

Age	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
8 " 11	1.69	1.86	.17		2.01	1.95	1.19	1.04
13 " 16	1.60	3.16	1.56		1.93	2.84	1.20	.89

Per Cent. of Each Age Group Reaching the 75 Per Centile of All

Age	8-11	11-12	12-13	13-16
Boys	27.02	27.72	29.14	25.96
Girls	28.22	27.95	38.70	41.91

In all of the foregoing arrays, the general superiority of the girls is in evidence. That this superiority increases relatively with age is apparent in the array for combined half years and extreme groups. It is also noted in the percentages of each group reaching the 75 per centile in which the girls are superior in every group but most so in the group from 13 to 16. Except in the extreme groups, the boys reach their maximum of median ability in the period from 11 to 12 years, the girls from 12 to 13 years. After the maximum is reached, there is a decline in median ability for both boys and girls, the ability for boys from 13 to 14 being less than from 10 to 11. For the girls there is a rhythm in ability, but each valley in it is higher than the preceding.

Comparison of Youngest and Oldest 25 Per Cents. of the A Grades

TABLE XLI

YOUNGEST AND OLDEST PUPILS OF THE A GRADES COMPARED

Boys

Grade		Median Age Yrs.	Mo.	M's	Higher Younger	Older	Q's	Co'ts. of Var.
4A	Younger 25%	9	8.0	.83			1.57	1.89
	Older "	12	9.5	.90		.07	.73	.81
	Whole Grade	11	.5	.98			1.37	1.39
5A	Younger 25%	10	2.5	1.16			1.68	1.44
	Older "	13	.5	1.50		.34	1.33	.88
	Whole Grade	11	9.2	1.28			1.57	1.22
6A	Younger 25%	11	1.5	3.50			3.25	.92
	Older "	14	5.5	4.33		.83	2.75	.63
	Whole Grade	12	4.0	4.30			2.43	.56

Girls

Grade		Median Age Yrs.	Mo.	M's	Higher Younger	Older	Q's	Co'ts. of Var.
4A	Younger 25%	9	4.0	1.75			1.15	.65
	Older "	12	3.5	1.25	.50		.76	.60
	Whole Grade	10	7.8	1.30			1.07	.82
5A	Younger 25%	9	10.5	2.12			1.41	.66
	Older "	12	6.5	2.16		.04	1.72	.79
	Whole Grade	11	4.0	2.07			1.54	.74
6A	Younger 25%	11	0.0	2.66			2.25	.84
	Older "	14	6.5	4.66		2.00	2.50	.53
	Whole Grade	12	7.5	4.50			2.88	.64
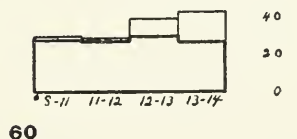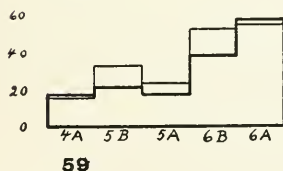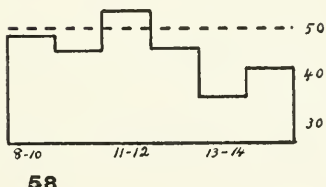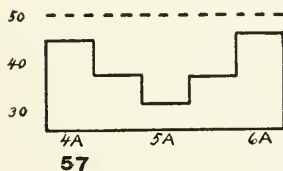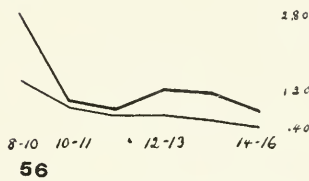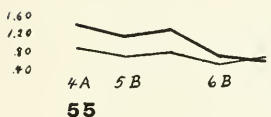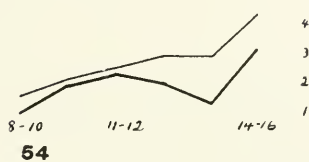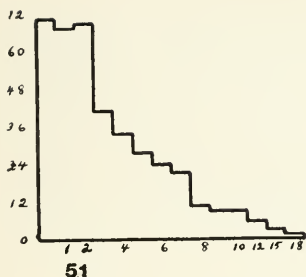
TEST VII

51. Frequencies of Abilities, Boys.
53. Median Ability, by Grades.
55. Variability, by Grades.
57. Per Cent. of Boys Reaching the 50
     Per Centile of Girls, by Grades.
59. Per Cent. of Pupils Reaching the 75
     Per Centile of All, by Grades.
         ———————— Boys.

52. Frequencies of Abilities, Girls.
54. Median Ability, by Age.
56. Variability, by Age.
58. Per Cent. of Boys Reaching the 50
     Per Centile of Girls, by Age.
60. Per Cent. of Pupils Reaching the 75
     Per Centile of All, by Age.
         ———————— Girls.

In every case except that of the girls in grade 4A, in this test, the older group reaches a higher median ability than the younger. In general, this is in contrast to results for the other tests. The relative superiority of the older groups also increases with advance through the grades. The median ability for the grade as a whole is reached by the older groups of boys in grades 5A and 6A, and of the girls by all but the older group of grade 4A and the younger group of grade 6A.

Sex Differences by Age

TABLE XLII

PER CENT. OF BOYS REACHING THE 50 PER CENTILE OF THE GIRLS

For Half Years				Combining Half Years and Smaller Groups	
Age	Per Cent.	Age	Per Cent.	Age	Per Cent.
8 to 9	100.00	12 to 12–6	47.45	8 to 10	48.14
9 " 9–6	58.33	12–6 " 13	43.24	10 " 11	45.23
9–6 " 10	30.76	13 " 13–6	35.89	11 " 12	53.46
10 " 10–6	59.37	13–6 " 14	28.57	12 " 13	45.83
10–6 " 11	48.07	14 " 14–6	40.00	13 " 14	35.85
11 " 11–6	50.79	14–6 " 15	40.00	14 " 16	41.66
11–6 " 12	57.89	15 " 16	100.00		

In 6 of the 14 half year groups, more than 50 per cent. of the boys reach or exceed the median ability of the respective groups of girls. However, two of these are in the lowest and highest age groups, respectively, where the numbers are very small. All of these six higher percentages for boys are below the 12 year period but one. In the array combining half years, the boys show superiority in the one year, 11 to 12, only. It is also in this age period that the percentage of boys in the highest quartile is greatest, although even here the girls show a larger percentage for superior ability, page 68.

Summary for Test VII

Grade Differences

The gain in per cent. from grade 4A to 6A is 338.77 for boys and 246.15 for girls. Reference to Table XXXVIII shows that for both boys and girls, the general progress from grade to grade is broken by a slight loss from grade 5B to 5A, but that it is regained by an increased advance to grade 6B. The array

for the per cent. of each grade reaching the 75 per centile of all shows coincidence from grade to grade with the changes in median ability. The variability also decreases through the grades with the same slight fluctuation in grade 5A.

Age Differences

Following Table XL, it was pointed out that, excepting in the small groups at the extremes of the array, the boys reach a maximum in median ability in the period from 11 to 12 years, the girls from 12 to 13 years. Beyond the maximum, there is a decline in ability for both boys and girls, the ability for boys being less from 13 to 14 than from 10 to 11. The decrease is much smaller for the girls. Both sexes advance again after the decrease, reaching their highest ability in the small groups from 14 to 16 years. The highest percentage reaching the 75 per centile for all is in the age period 12 to 13 for boys, and 13 to 16 for girls. For the girls a larger percentage of this superior ability is found in the age period from 8 to 11 than from 11 to 12. The rhythm in the array for median ability is as evident as in the other tests. The more marked progress made through the grades is not so apparent in the age distribution. In general, boys of 13 do almost no better than boys of 10, but boys of the sixth grade do do better than those of the fourth and fifth grades. School training seems to be a factor in the test. However, in a given grade, the pupils in the oldest quartile do better than those in the youngest, as seen in Table XLI. The variability for both sexes is a little higher up to 12 years than from 12 years forward, the younger children vary more than the older in this test.

Sex Differences

In median ability, the girls are superior to the boys in every grade. In the age distribution, 6 of the 14 groups of boys show more than 50 per cent. reaching the 50 per centile ₁ of the respective groups of girls, but in combining the half years these percentages all fall below 50 except for the period, 11 years to 12. In the half year array, all of the higher percentages for boys are for periods under 12 years but one, that from 15 to 16. The sex difference is greater above 12 years than below. A higher

percentage of girls than of boys is found in the highest quartile of ability in all of the grades excepting 4A and 5A, and in all of the age periods. The percentage of the whole group of 385 boys who reach the median ability of the whole group of girls is 46.75. The variability of the boys is greater than that of the girls in every age group, and in every grade excepting 6A where it is slightly higher for the girls. For all of the boys taken together, the coefficient of variability is 1.07, for the girls, .78. In the arrays for smaller groupings, there are no significant differences apparent.

Array of Combined Results of the Seven Tests

As a type of gross summary, from which too much must not be inferred, the sums of the results for the several separate tests have been taken and arrayed by the same distributions as the results of each separate test. These results will form one basis for comparisons of grades, ages, and sexes in the several abilities all taken together.

TABLE XLIII

FREQUENCY OF ABILITIES BY GRADES

Ability	Grade 4A B	4A G	5B B	5B G	5A B	5A G	6B B	6B G	6A B	6A G
20 to 25		1								
25 " 30	2									
30 " 35	2	1								
35 " 40	3	1		1						
40 " 45	1	2								
45 " 50	2	1								
50 " 55		3	1		1					
55 " 60			1		1	1				
60 " 65	3		1			1				
65 " 70	4	1				1				
70 " 75	3	1		1	2			1		
75 " 80	3	1	1	1	1		1			
80 " 85	3			1						1
85 " 90	4	3	1	1						
90 " 95	5	2	1	1	2	2		1		1
95 " 100	3	5		1	2	1				
100 " 105	1	7			2					
105 " 110	5	2	3	1	3					
110 " 115	2	2	3	2		1	1			1
115 " 120	1	7	6	6	2	2	4			1
120 " 125	4	3	4	3	1	5	1			1
125 " 130	4	1	3	4	1	2	1	1		
130 " 135	3	5	3	8	5	2	1			
135 " 140	5	7	3	7			5	2		
140 " 145	4	9	2	4	2	5	2	1		1
145 " 150	4	3	1	4		1	2	4	1	1
150 " 155	2	3	5	6	1	1	4	1	2	1
155 " 160	3	4	4	3	1	2	2	5	1	1
160 " 165	1	5	4	3	4	2	2	2	1	
165 " 170	1	1	2	5	4	3	8	5	3	1
170 " 175	2	1	4	2	4	3	3	3	3	4
175 " 180	1	2	3	3	3	3	6	4	4	
180 " 185	1	1	4	3	1	2	4	7	3	3
185 " 190	1	1	1	4	2	3	5	5	1	3
190 " 195	1		3	3	2	2	4	3		2
195 " 200	2		4	2	5	2	6	6	3	3
200 " 205					3		4	4	3	5
205 " 210	2	1	3	2	1	5	7	4	1	2
210 " 215			3	2	2	2	5	5	3	5
215 " 220	2		1	1		1	2	4	2	3
220 " 225	1		1		1	1	1	3	1	6
225 " 230			1				3	2	4	2
230 " 235		1	1	1			2	3	4	1
235 " 240	1					1	1	3	2	7
240 " 245	1						2	1	4	
245 " 250							4		1	1
250 " 255			1				2		2	2
255 " 260							2	1	1	
260 " 265						2	1			
Cases	93	88	79	86	65	58	98	81	50	59

TABLE XLIV

MEDIAN ABILITY AND VARIABILITY FOR EACH GRADE

Grade	M's		Higher		Q's		Co'ts. of Var.	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
4A	117.50	130.00		12.50	34.01	22.08	.28	.16
5B	155.62	146.25	9.37		29.84	23.31	.19	.15
5A	160.62	165.00		4.38	32.81	32.50	.20	.19
6B	187.00	188.50		1.50	24.62	22.25	.13	.11
6A	205.00	204.50	.50		27.50	21.14	.13	.10
For all	165.83	159.25	6.58		37.03	34.08	.22	.21

Per Cent. of Each Grade Reaching the 75 Per Centile of All

Grade	4A	5B	5A	6B	6A
Boys	9.67	18.97	19.95	42.85	62.00
Girls	2.27	10.45	24.13	45.65	64.37

For both sexes, there is progress from grade to grade, both in median ability and in the percentages reaching the highest quartile for all. A larger percentage of the boys reach the highest quartile for all in grades 4A and 5B, while the percentage is larger for girls in the upper three grades.

Sex Differences by Grades

Per Cent. of Boys Reaching the 50 Per Centile of the Girls

Grade	4A	5B	5A	6B	6A
Per Cent.	45.1	58.2	44.6	50.0	50.0

In grade 5B only are the boys decidedly superior. In grades 6B and 6A, the two sexes are practically the same in ability, just 50 per cent. of the boys reaching the median ability of the girls in each grade.

TABLE XLV

Frequency of Abilities by Ages

Ability	Age 8–10 B	G	10–11 B	G	11–12 B	G	12–13 B	G	13–14 B	G	14–16 B	G
20 to 25						I						
25 " 30	I								I			
30 " 35			I	I					I			
35 " 40		I	2		I					I		
40 " 45			I	I				I				
45 " 50					I	I					I	
50 " 55		I		I			2			I		
55 " 60		I					2					
60 " 65	I		I				I		I	I		
65 " 70	I				I	I	2	I				
70 " 75			I		2		I	I	I	I		I
75 " 80	I		I		2	I	I	I	I	I		
80 " 85			I		I		I					
85 " 90		I		I	2		I		2	2		
90 " 95	2	I		I	I	3	I		3	2	I	I
95 " 100	I	I		3	3	2		I			I	
100 " 105	I	I	I	5			I	I				
105 " 110		I	3		2	I	3	I	I		I	
110 " 115				I		3	I	I	5	I	I	
115 " 120		7	3	I	4	4	I	2	2	I	2	I
120 " 125	I	2	2	I	2	4	2	2	2	I	I	2
125 " 130	I	I	3		2	3	2	2	I	I		I
130 " 135	I	4	4	7	I	6	6	2		I		
135 " 140			2	4	6		3	4	3	I		
140 " 145		4	4	4	5	5		6	I	I		I
145 " 150			2	5	I	I	4	7	I		I	I
150 " 155		2	5	5	3		5	2	3	2	2	I
155 " 160	I	4	I	3	4	4	2	3	2	I	I	
160 " 165		I	4	3	4	2	2	3	2	3		
165 " 170	I		5	2	3	8	5	4	2	3	2	
170 " 175	2		4	2	6	I	3	6	I	I		I
175 " 180	I	I	2	2	2	4	7	4	3	I	I	
180 " 185	I		I	4	2	6	6	4	3	2	I	I
185 " 190	I	3	4	I	2	3	3	2		2		2
190 " 195	I		2	4	2	2	4	3	I	I		
195 " 200	3	4	3	I	7	2	3	3	3	3	I	
200 " 205			2	I	4	3	2	2	I	2	I	I
205 " 210	I	I	5	4	5	2	3	5	I	2		
210 " 215			4	3	4	5	3	4		2	2	
215 " 220			3	I	I	3		3	I	I	2	I
220 " 225	I		I	I			2	2	5	I	2	
225 " 230	I		I			3	2	I	2	I		
230 " 235			I	4	4	I	2					I
235 " 240			I	2	2	2	2	4		I		
240 " 245	I			I	I		3		2			
245 " 250			2	I	2		I					
250 " 255					3	I	I	I			I	
255 " 260			I			I			I		I	
260 " 265	I	I						I				
Cases	27	43	84	81	101	93	96	93	53	46	24	16

TABLE XLVI

Median Ability and Variability for Each Age

		M's		Higher		Q's		Co'ts. of Var.	
	Age	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
8	to 9	72.00	158.50		86.50	5.50	77.50	.07	.48
9	" 9-6	184.50	124.50	60.00		48.50	17.20	.26	.13
9-6	" 10	171.50	144.50	27.00		41.75	33.44	.24	.23
10	" 10-6	168.50	155.00	13.50		48.00	29.20	.28	.18
10-6	" 11	164.50	156.50	8.00		28.00	31.75	.17	.20
11	" 11-6	165.75	164.50	1.25		33.25	32.00	.20	.19
11-6	" 12	172.00	166.50	5.50		35.12	40.75	.20	.24
12	" 12-6	167.75	175.50		7.75	33.25	32.83	.19	.18
12-6	" 13	167.75	167.00	.75		26.37	25.29	.15	.15
13	" 13-6	155.50	168.00		12.50	39.50	34.12	.25	.20
13-6	" 14	152.50	166.50		14.00	35.00	56.50	.23	.33
14	" 14-6	154.75	151.00	3.75		47.25	15.00	.30	.09
14-6	" 15	180.50	203.50		23.00	36.25	52.25	.20	.25
15	" 16	180.50	123.50	57.00		50.50	33.25	.28	.27

Combining Half Years and Smaller Groups:

8	" 10	169.50	138.50	31.00		50.18	26.67	.29	.12
10	" 11	165.00	154.75	10.25		35.20	30.67	.21	.19
11	" 12	169.50	165.75	3.75		33.89	35.56	.19	.21
12	" 13	168.50	172.16		3.66	31.75	31.37	.18	.18
13	" 14	153.50	167.00		13.50	34.83	38.50	.22	.23
14	" 16	163.00	151.00	12.00		47.00	32.00	.28	.21

Combining Further the Extreme Groups:

8	" 11	166.16	150.50	15.66		35.52	32.50	.213	.215
13	" 16	155.50	165.50		10.00	41.17	37.50	.26	.22

Per Cent. of Each Age Group Reaching the 75 Per Centile of All

Age	8-11	11-12	12-13	13-16
Boys	26.12	29.70	21.86	23.36
Girls	19.35	25.80	32.25	27.60

In the percentages reaching the highest quartile, the boys are superior up to 12 years, the girls afterward. The boys reach their maximum from 11 to 12 years, the girls a year later. Both are inferior, from 13 to 16 years, to their earlier years, the boys showing larger percentages at both 8 to 11 and 11 to 12, than at either 12 to 13 or 13 to 16. In the arrays for age periods, the rhythms mentioned for individual tests are very evident.

Comparison of Youngest and Oldest 25 Per Cents. of the A Grades

TABLE XLVII

SMALL: YOUNGEST AND OLDEST PUPILS OF THE A GRADES COMPARED

Grade		Median Age Yrs.	Mo.	M's	Higher Younger	Older	Q's	Co'ts. of Var.
		Boys						
4A	Younger 25%	9	8.0	114.00			58.25	.51
	Older "	12	9.5	97.00	17.00		30.25	.31
	Whole Grade	11	.5	117.50			34.01	.28
5A	Younger 25%	10	2.5	162.50			35.25	.21
	Older "	13	.5	132.50	30.00		41.18	.31
	Whole Grade	11	9.2	160.62			32.81	.20
6A	Younger 25%	11	1.5	202.50			21.50	.10
	Older "	14	5.5	205.00		2.50	18.75	.09
	Whole Grade	12	4.0	205.00			27.50	.13
		Girls						
4A	Younger 25%	9	4.0	123.50			20.50	.16
	Older "	12	3.5	111.00	12.50		36.62	.33
	Whole Grade	10	7.8	130.00			22.08	.16
5A	Younger 25%	9	10.5	184.50			30.75	.16
	Older "	12	6.5	149.50	35.00		24.75	.16
	Whole Grade	11	4.0	165.00			32.50	.19
6A	Younger 25%	11	0.0	216.50			19.50	.09
	Older "	14	6.5	184.50	32.00		43.75	.23
	Whole Grade	12	7.5	204.50			21.14	.10

In every case except that of the boys for grade 6A, the youngest 25 per cent. of the pupils of these three grades reach a higher total in median ability than the oldest 25 per cent. in the respective grades. This is in harmony with the general tendency shown in all of the tests excepting VII. Of the 12 groups, 4 only reach or exceed the median of their whole respective grades, the younger boys of grade 5A, the younger girls of 5A and 6A, and the younger boys of 6A.

Sex Differences by Age

TABLE XLVIII

PER CENT. OF BOYS REACHING THE 50 PER CENTILE OF THE GIRLS

	For Half Years			Combining Half Years and Smaller Groups	
Age	Per Cent.	Age	Per Cent.	Age	Per Cent.
8 to 9	00.00	12 to 12–6	42.37	8 to 10	59.25
9 " 9–6	83.33	12–6 " 13	54.05	10 " 11	58.33
9–6 " 10	61.53	13 " 13–6	38.46	11 " 12	52.47
10 " 10–6	56.25	13–6 " 14	42.85	12 " 13	47.91
10–6 " 11	57.69	14 " 14–6	60.00	13 " 14	39.62
11 " 11–6	53.96	14–6 " 15	20.00	14 " 16	62.50
11–6 " 12	52.63	15 " 16	75.00		

In 9 of the 14 half year groups, more than half of the boys reach or exceed the median ability of the girls in this array. Up to 12 years the boys are superior in every period excepting the first, that from 8 to 9 years. In the array for combined half years, the three groups up to 12 years, and the one from 14 to 16 years, show the boys as superior. From 10 years to 14, the girls gain on the boys each year, surpassing them from 12 years to 14, when the boys again forge ahead.

Summary for the Combined Results

Grade Differences

For both boys and girls, there is progress from grade to grade, both in median ability and in the percentages reaching the highest quartile for all. The per cent. of gain is 74.46 for boys and 57.30 for girls. The distribution of these gains through the grades is very irregular, as may be seen in the following summary of gains in per cent. from grade to grade:

	Per Cents.		Higher	
Grades	Boys	Girls	Boys	Girls
4A to 5B	32.44	12.50	19.94	
5B " 5A	3.21	12.82		9.61
5A " 6B	16.43	14.24	2.19	
6B " 6A	9.62	8.48	1.14	

The variability for both boys and girls is slightly lower in the upper grades than in the lower.
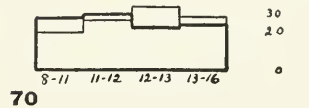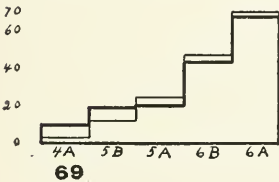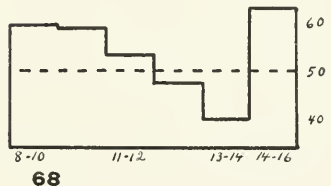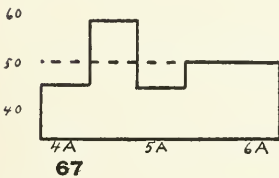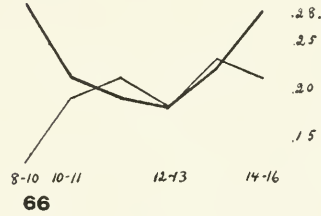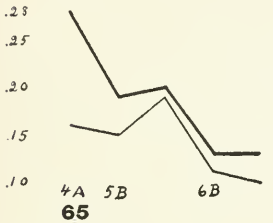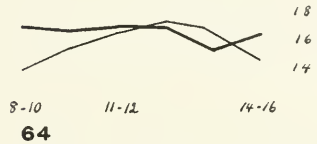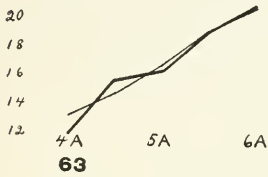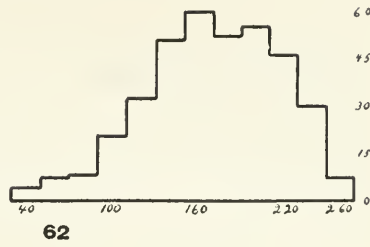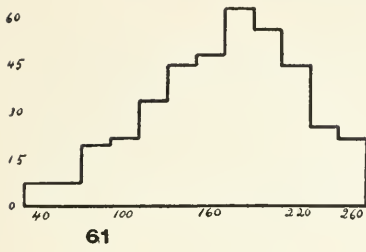
FIGURES 61–70.
TOTALS

61. Frequencies of Abilities, Boys.
63. Median Ability, by Grades.
65. Variability by Grades.
67. Per Cent. of Boys Reaching the 50
    Per Centile of Girls, by Grades.
69. Per Cent. of Pupils Reaching the 75
    Per Centile of All, by Grades.
    ———— Boys.

62. Frequencies of Abilities, Girls.
64. Median Ability, by Age.
66. Variability, by Age.
68. Per Cent. of Boys Reaching the 50
    Per Centile of Girls, by Age.
70. Per Cent. of Pupils Reaching the 75
    Per Centile of All, by Age.
    ———— Girls.

Age Differences

In the arrays for half years and the combination of these into years, the rhythmic variation in the individual tests is noticed. As a whole, there is seen to be a loss in ability with the progress of age for the boys, and a gain for the girls. The boys reach their maximum, save for the two small extreme groups from 14 to 16, at 12 years, the girls theirs one year later. In the comparison of youngest and oldest 25 per cents. of each grade A, the youngest pupils are superior in every case excepting that of the boys in grade 6A. Variability is just slightly higher for the younger boys, and for the older girls.

Sex Differences

In Table XLIV it is seen that in two of the five grades, 5B and 6A, the boys reach a higher median ability than the girls. Taking all of the boys together, they reach a higher median, 165.83, than all of the girls taken together, 159.25. Half or more of the boys reach the median ability of the girls in grades 5B, 6B, and 6A. A larger percentage of boys is found in the upper quartile in grades 4A and 5B, but of girls in the upper three grades. In the age distribution, the median ability of the boys is higher in 9 of the 14 groups, in general the boys being superior in the earlier years, up to 12, the girls superior above 12 years. This is also true of the percentage for each age group found in the highest quartile, and the percentage of boys who reach the 50 per centile of the girls, Table XLVIII. In the comparison of the youngest and oldest 25 per cents. of the three A grades, the girls reach a higher median ability than the boys in every one of the six groups except that of the older for grade 6A. Evidently the generalizations possible upon the basis of central tendencies alone would not apply at all rigidly to the more variable lowest and highest 25 per cents. of each grade. Beyond the limits of the probable error, the girls seem to be superior in every grade excepting in the upper quartile of grade 6A. In variability, the boys are greater in every grade, the difference being greatest in the grades at the ends of the distribution, 4A and 5B, and 6A. In the age distribution, there are 9 of the 14 groups in which the boys show greater variability, the 5 groups higher for girls being so interspersed as to produce a rythmic alternation, as seen in Table XLVI.
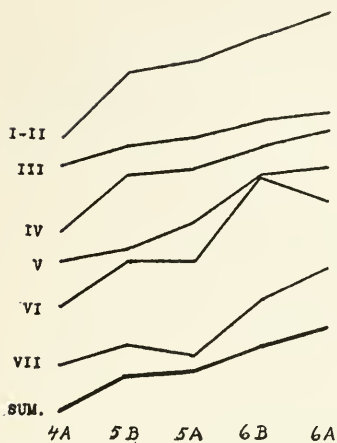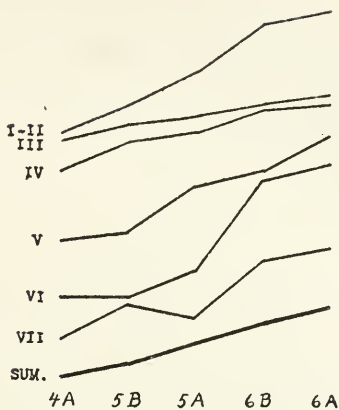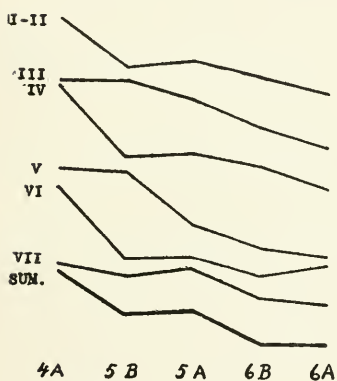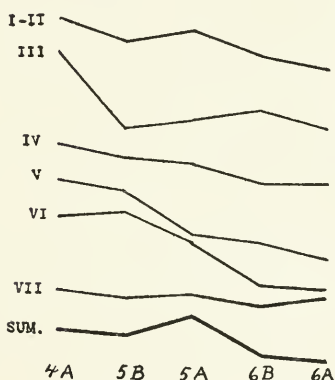
FIGURES 71–74.

SUMMARIES OF ALL TESTS, BY GRADES

71. Median Ability, Boys.
73. Variability, Boys.

72. Median Ability, Girls.
74. Variability, Girls.

Relative Progress in the Grades

Table XLIV, and Figure 63, show that there is progress from grade to grade in the totals for the tests but in very different proportions. A tabulation of these gains in per cents. will indicate the differences.

TABLE XLIX

Per Cents. of Gain from Grade to Grade

Grades	Per Cents. Boys	Girls	Grades	Per Cents. Boys	Girls
4A to 5B	32.44	12.50	5A to 6B	16.43	14.24
5B " 5A	3.21	12.82	6B " 6A	9.62	8.48

For boys, there is a very marked difference in passing from the A section of one grade to the B section of the other and but little difference in passing from the B section to the A section of the same grade. The boys of the two sections of one grade are much more alike than the boys of the upper section of that grade and the lower section of the following grade. Here, the pupils of the divisions of grade 5 are a much more homogeneous group than those of 5A and 6B taken together would be. At mid-year, grade 5B automatically becomes grade 5A, while a group from grade 4A comes into grade 5 as the new 5B. Usually much more care is taken in the control of school ability in promoting from the one grade into the next than in permitting continuance in a grade of those of weak ability when they are once in that grade. Thus, by a more careful selection on the basis of school ability for the B section, and a greater tolerance for the A section, the condition here revealed is, at least partly, explained. For girls, the difference here noted does not appear until the transition from grade 6B to 6A is made. The greater tendency toward regularity in the work and school progress of the girls asserts itself here as the probable explanation.
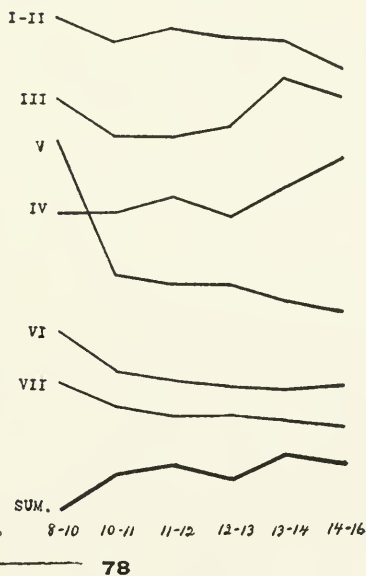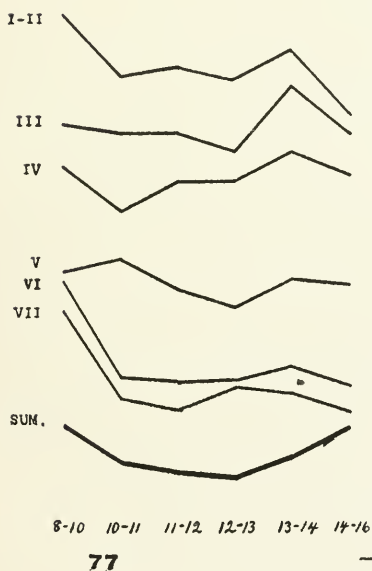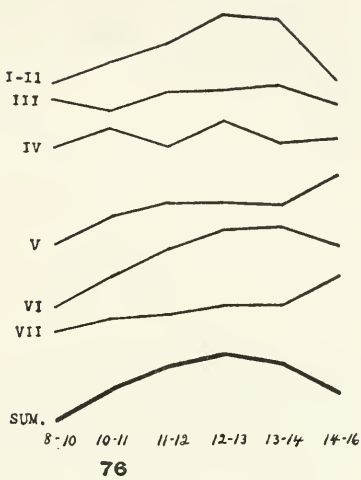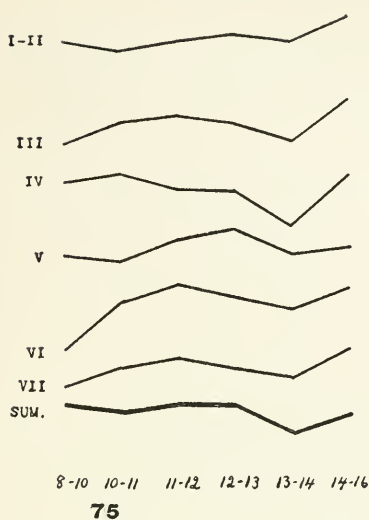
FIGURES 75–78.

SUMMARIES OF ALL TESTS, BY AGE

75. Median Ability, Boys.   76. Median Ability, Girls.
77. Variability, Boys.   78. Variability, Girls.

Relative Progress with Age

In the array of results for the totals of the tests with age, it is seen that there is just as often a decline as an advance:

TABLE L

Per Cents. of Gain or Loss from Year to Year

| | Per Cents. | |
Years	Boys	Girls
8–10 to 10–11	−2.6	11.6
10–11 " 11–12	2.7	7.1
11–12 " 12–13	− .5	3.7
12–13 " 13–14	−8.9	−2.9
13–14 " 14–15	6.1	−9.5

For the girls, there is a diminution in the gain until it becomes negative at 13. For the boys, there is the rise to 12, then the fall to 14, then the rise again. These general fluctuations are represented graphically in Figure 64.

Prominent Sex Differences Among the Tests

That the boys are superior to the girls in mathematical judgment, and in the form of selective judgment represented by test V, is clearly true, and that the girls are superior in the form of controlled association represented by the opposites test, and in the literary interpretation, is also evident. In the form of controlled association represented by test III, the boys are also slightly superior. In kind, this test is more like the mathematical test and that of selective judgment as found in test V than is test IV, the opposites. In test VI, in selective judgment among definitions, the girls are just slightly superior. Here again is a test having elements somewhat like those of the opposites test—it deals with words. It may be noted especially that in the three tests dealing with words in a rather special way, the opposites test, the test using definitions, and the test in intellectual interpretation of literature, the girls show superiority. There is certainly tested here an ability that is different in the sexes, or at least an attitude of mind that brings superior results from girls. This may be the element of attention to detail, or patience in analysis, or a keener sense for the meanings of words and phrases, or a more accurate form of expressing their meaning, or a combination of these all lending their influence. It

has been generally found that in all of these elements girls seem to be slightly superior to boys. In looking over the papers of test VII, that of literary interpretation, it seems to me that the two elements, attention to detail, and patience in analysis, are the dominant factors in that test. The girls seem to work a little harder, attend more to details, and give a more patient analysis to the poems than do the boys. A negative factor on the part of the boys also probably must be taken into account in the poorer showing of the boys—in these grades boys do not generally like poetry. To be rid of the matter as soon as possible would be the attitude of the boys much more than of the girls in this test, and much more so than in any of the other tests.

That the median ability of the boys is slightly higher than that of the girls, all taken together, and that 53.50 per cent. of the boys reach or exceed the median ability of the girls, all tests taken together, would indicate a slight superiority for the boys. The ratio of the median ability of the boys to that of the girls, however, is but 1.041 ; and the percentage of boys found in the highest quartile, taking all results into account, is 25.4 while that of the girls is 25.5. In variability, the boys are slightly higher, the ratio being 1.047. However, these summaries by combining results of the numerous individual tests must not be taken at nearly so high a value, for validity, as are the details of the individual tests. Mental abilities are too complex to be rated very extensively in the mass. One very marked sex difference shown in the totals is that of the relative fluctuations of ability between the sexes. This difference is graphically shown in Figures 67 and 68, where the very marked superiority of the boys in grade 5B is evident, and where the diminishing ability of boys, relatively as well as absolutely, from 12 to 14 is brought out. That, on the whole, the resemblances between the sexes are far greater than the differences, is very evident in all of the figures in the general parallelism in fluctuations in median ability, and the even closer parallelism in variability.

VARIABILITY

These tests all show that the variability of both boys and girls diminishes from grade 4A upward to grade 6A. In most of the tests there is a slight fluctuation upward from grade 5B to 5A,
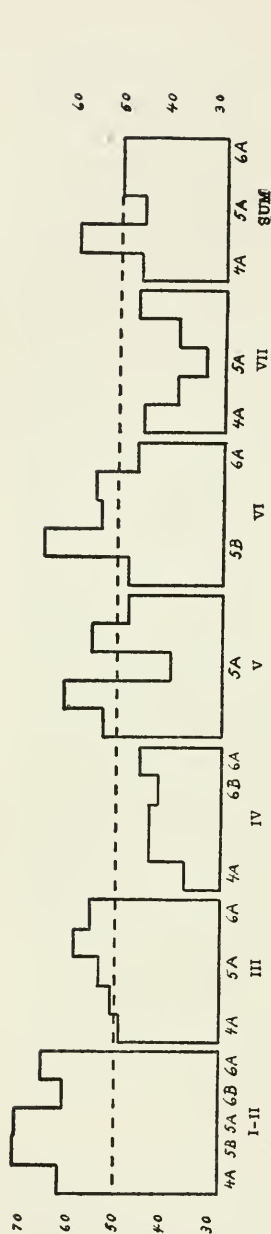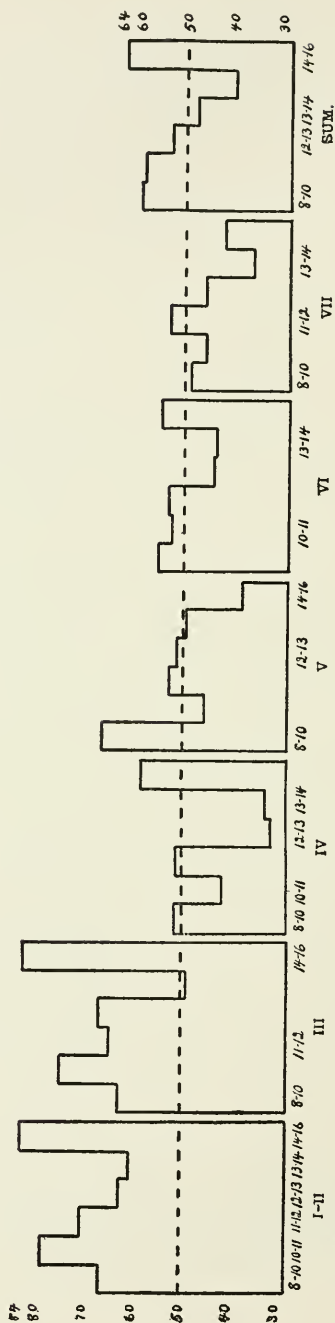
FIGURES 79–80.

SUMMARIES OF ALL TESTS FOR SEX DIFFERENCES

79. Per Cent. of Boys Reaching the 50 Per Centile of Girls, by Grades.
80. Per Cent. of Boys Reaching the 50 Per Centile of Girls, by Age.

however. On the basis of age, there is a general fall in variability from 9 to 12, then a rise to 14, followed by a second fall to 16. In most of the tests there is a slight rise at 11 years. On the whole, variability is greater from 13 to 14 than from 10 to 11, as is graphically shown in Figure 66. In the first three of the six tests, those found easiest, the total variability of the girls is greater than that of the boys. Taking the totals of all, the boys are slightly higher, the ratio being 1.047. The fluctuations are so numerous, and the differences so slight, that it seems unsound to make any general statement to the effect that the boys of these grades are more variable than the girls, in so far as these tests have shown. If we should refer to some relatively isolated quality, we do have evidence of definite differences here for the six tests. A summary of the coefficients of variability for the several tests for each sex will indicate where sex differences are somewhat pronounced in variability.

TABLE LI

COEFFICIENTS OF VARIABILITY FOR EACH TEST

Test	Boys	Girls	Ratio of Boys to Girls
I–II	.26	.39	.66
III	.10	.11	.90
IV	.18	.13	1.38
V	1.07	1.41	.75
VI	.91	.87	1.04
VII	1.07	.78	1.37
Totals	.22	.21	1.04

In Dr. Stone's study in arithmetical abilities of children,[18] he found an average ratio of variability of boys to girls in 250 sixth grade children of each sex to be .95, while here for 148 sixth grade boys and 140 girls there is an average ratio of .68. The ratio of all of the boys, 385, to all of the girls, 372, in this study in the arithmetic tests is .66.

The diminishing variability as we pass up the grades together with the quite different results of progress with age indicates that the upper school grades tend toward a selection of pupils amongst whom variability is low and uniform. School grade is a much better index of variability than is age taken alone.

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[18] Stone, Arithmetical Abilities and Some Factors Determining Them, *Columbia University Contributions to Education*, No. 19, 35.

RESEMBLANCES AND DIFFERENCES IN THE TESTS

As group tests, reference to the tables giving the arrays of median abilities and variability, and to the graphical representations of these, will show that the correlation among them is very high. On the basis of grade distribution, the correlation is higher than in the age distributions. Reference to Figures 71-78, will show that, both in the facts of fluctuation and the amounts of fluctuation, there is an especially close resemblance between tests I-II and V, III and VI, and VI and VII, respectively. Although quite alike in kind, in amount the fluctuations of tests V and VI are quite unlike. The same differences and resemblances in the qualitative character of the tests pointed out in the discussion of prominent sex differences will apply here.

The differences in difficulty in the tests may be observed in an array of the per cents. of gain or loss by grade and age which follows:

TABLE LII

PER CENTS. OF GAIN OR LOSS IN THE SEVERAL TESTS

Tests	From Grade 4A to 6A		From 8–11 to 13–16	
	Boys	Girls	Boys	Girls
I–II	93.10	128.16	9.30	25.00
III	21.13	19.30	.14	−.08
IV	48.14	26.97	−11.24	−2.15
V	777.86	1045.02	4.83	120.00
VI	382.75	421.62	.16	128.57
VII	338.77	246.15	−5.00	69.89
Totals	74.46	57.30	−6.41	9.98

The difference in difficulty of the tests may be brought out still more clearly by the ratio of the median ability shown in each test to the highest grade that it was possible to make in it. The following table gives these ratios, using the medians for all of the pupils of each sex taken together.

TABLE LIII

RATIO OF MEDIAN GRADES TO HIGHEST POSSIBLE GRADES

Tests	Boys	Girls
I–II	.56	.44
III	.76	.74
IV	.74	.77
V	.26	.21
VI	.17	.18
VII	.091	.098
Totals	.53	.51

These arrays of results clearly verify the grouping of the tests into the four species called respectively, mathematical judgment, I and II, controlled association, III and IV, selective judgment, V and VI, and intellectual literary interpretation, VII. The first three tests are seen to be much easier than the last three, VII the hardest of all, and IV, VI, and VII easier for the girls than for the boys.

Separation of Native Capacity from School Training

While the abilities here tested are complexes of native capacity and school training, certain tendencies toward the isolation of each appear. In the marked gains in per cents. for selective judgment where acquired information is a very important factor, the influence of school training is evident. In the very definite contrast between younger groups and older to the advantage of the younger, regardless of grade, in the new grouping of those in the highest quartile of ability for all where pupils are brought together who are equal in rank from grades 4A and 6A, and in the rather marked sex differences for tests I-II, and V in favor of the boys, and IV and VII in favor of the girls, we have evidences probably emphasizing native capacity. In the loss in ability from the 8-11 years group to the 13-16 years group, there is also some evidence of differing degrees of native capacity as well as of periodicity of growth. The older group contains a considerable number of pupils who are several years beyond the median age of their respective grades. Naturally, the most retarded pupils are in the upper age groups. Table LII would indicate that the ability measured by tests III and IV, controlled association, is a specialized ability and not much influenced by school training. The girls lose in these tests in the age distribution, but in none of the others, making a substantial gain in the grade distribution. In the array for age, the boys also lose in tests IV and VII, tests in which they are inferior in median ability. Possibly the ability here involved is, at the upper age period, in a " resting stage," and relatively inactive at this time. But even if this be true, a loss in this ability in contrast with a gain in all others would mark it as dependent upon a specialized capacity.

However, group results can do little more than point to ten-

dencies in the matter of isolation of dominant factors producing the results. More definite answers to the question lie in the study and correlation of individual abilities.

General Conclusions

A review of general conclusions here could be little more than a repetition of the statements of detail given in the summaries for the several tests and for the combined results. However, a summary of certain general tendencies supported by the more detailed statements may here be in place.

It is believed that the results justify the following conclusions:

1. In the progressive development shown in median ability through the grades tested, and in the high group correlations among these tests, it is evident that they are valid measures of several phases of that complex capacity we call reasoning ability. Group correlations are so much higher among these tests than among those so far produced among mental abilities more varied in kind that we are clearly justified in holding them to be tests of abilities which are varieties of one general species of ability.

2. In the contrasts between grade progress and progress with age, in the generally superior showing made by the younger groups of children of any grade when contrasted with the older pupils of the grade, and in the fairly substantial percentage of pupils from lower grades found in the highest quartile of ability for all, it is shown that native capacity is measured to a high degree by the tests.

3. In consideration of the rather varied range of information required, as well as the sagacity necessary to resolve the problems, all of the foregoing differences between grade standings and age standings suggest that these tests are even better measures of intellectual capacity than are the usual factors determining the school grade in which the pupil is placed.

4. In the general superiority of the boys over the girls in tests I and II, III, and V, and of the girls over the boys in tests IV, VI and VII, it is clear that there are real, measurable sex differences, small, to be sure, but no less real, among these more than seven hundred children.

5. While the variability of the boys is slightly greater than that of the girls in some tests, in other tests the girls are more

variable, so that, taken as a whole, the boys are only slightly more variable. In general, it has also been shown that, as group tests, there is here an inverse relationship between median ability and variability—in those tests in which the median ability of the boys is higher than that of the girls, the variability is lower, and *vice versa*.

6. The point of greatest pragmatic significance for the school lies in the implications from the two facts, first, that there are quite substantial percentages from both the lower grade groups and lower age groups who are found in the highest quartile of ability for all; second, that most of the groups of the youngest 25 per cent. in each grade show higher ability than the oldest 25 per cent. and sometimes higher than that of the median ability of the whole grade. These facts suggest that perhaps the worst type of retardation in the schools is the withholding appropriate promotion from those pupils who are the most gifted, therefore of most significance as social capital. Are these pupils utilizing their abilities in the healthful measure possible for their best development?

The foregoing conclusions relate wholly to group abilities and relationships. Correlations of additional interest which may serve also to verify, or modify, the conclusions derived from the groups may be revealed by correlations of individuals.

CORRELATIONS OF INDIVIDUAL ABILITIES

Correlations of individual abilities in each of the tests in reasoning ability with each of the others, in each of these tests with the spelling test, and in each test with the total of the combined results of all of the tests in reasoning ability have been developed by distributions upon the basis of both school grade and age. The tests are arranged in the tables in the same order and by the same designations as were used in the group relationships. However, for the sake of easy recall they are here repeated. Tests I and II, combined, are the mathematical tests; tests III and IV are of controlled association, III A being that of filling blanks in sentences with the appropriate word, and III B the striking out of the inappropriate word of two given words in sentences, while IV is the opposites test; tests V and VI are of selective judgment, V, the selection of correct reasons for certain conditions from among a number some of which are erroneous or irrelevant, VI, the similar selection of good definitions of things or terms from among a number given; test VII is of the intellectual interpretation of poems. The gross sum of results for each pupil in the tests in reasoning ability, the total, is designated by the abbreviation, Tot. The spelling test is designated by the abbreviation, Sp.

Throughout, the coefficients of correlation have been derived by the method of like and unlike signs. In all cases save that of the specific illustration of grade 6A for boys, the gross coefficients are given. The coefficients for the boys of grade 6A were corrected for attenuation by both of the standard methods so far developed.[1] The average of the two corrected coefficients is taken as the most reliable coefficient. For every relationship, it is seen to be considerably higher than the gross coefficient. In reading the results in the following pages, all coefficients are therefore to be taken as lower than the true relationships. While the processes of corection here used show certain inadequacies

[1] Thorndike, Mental and Social Measurements, pp. 128–130.

to provide wholly against slight degrees of unreliability, due probably to variations in the distributions somewhat remote from the normal, it is believed that the average derived from the coefficients gotten by the two methods of correction have a high degree of reliability.

TABLE LIV

An Example of Corrected Coefficients of Correlation
Grade 6A. Boys. 50 Cases

Tests			Gross Co'ts.	Corrected Co'ts. by Meth I.	Corrected Co'ts. by Meth. II	Average of Corrected Co'ts.
I–II and		III	.31	.55	.37	.46
"	"	IV	.43	1.04	.57	.81
"	"	V	.00	.39	−.20	.10
"	"	VI	.31	.99	.45	.72
"	"	VII	.25	.46	.36	.41
"	"	Sp.	.19	.50	.19	.34
III	"	IV	.73	1.61	1.18	1.39
"	"	V	.43	.76	.62	.69
"	"	VI	.37	.46	.51	.48
"	"	VII	.48	1.19	.79	.99
"	"	Sp.	.43	.70	.69	.70
IV	"	V	.31	.96	.42	.69
"	"	VI	.43	.24	.69	.46
"	"	VII	.48	1.41	.77	1.09
"	"	Sp.	.06	.35	−.16	.09
V	"	VI	.54	.59	.79	.62
"	"	VII	.13	.70	−.10	.30
"	"	Sp.	.19	.00	.42	.21
VI	"	VII	.13	.86	−.10	.38
"	"	Sp.	−.06	.67	.09	.38
VII	"	Sp.	.13	.53	−.16	.19

Although the gross coefficients are too low, for purposes of comparison it is believed that they are highly reliable and that practically all stations of relative position here derived and all inferences made would remain substantially the same by the use of corrected coefficients.

Because of the fact that the gross coefficients are here used, this report upon individual relationships is to be taken as preliminary. The immense amount of time and labor required to correct the more than 1,400 coefficients precludes a final report at this time.

Arrays of Coefficients of Correlation by Grade, Age, and Sex

That the number of pairs of cases from which each of the coefficients is derived may be readily seen, the following summary of the numbers used is here stated.

Number of Children Used for Individual Correlations

Grade	4A	5B	5A	6B	6A	Total
Boys	93	79	65	98	50	385
Girls	88	86	58	81	59	372

TABLE LV

CORRELATION OF EACH TEST WITH EACH OF THE OTHERS BY GRADES

			Boys					Girls					
		4A	5B	5A	6B	6A	Average	4A	5B	5A	6B	6A	Average
I–II and	III	.61	.61	.31	.10	.31	.39	.63	.29	.32	−.14	.49	.32
" "	IV	.53	.18	.22	.28	.43	.33	.45	.32	.65	−.21	.34	.31
" "	V	.28	.14	.26	.35	.00	.21	.11	.22	.27	.10	.19	.17
" "	VI	.22	.06	.02	.10	.31	.10	.25	.25	.32	.21	.53	.31
" "	VII	−.05	.33	.40	−.03	.25	.18	.32	.25	.16	−.21	−.13	.08
" "	Tot.	.47	.23	.17	.43	.59	.38	.73	.55	.68	.21	.73	.58
" "	Sp.	08	.14	.07	.32	.19	.16	45	.29	.05	−.06	.29	.20
III and	IV	.59	.37	.64	.43	.73	.55	.76	.29	.47	.77	.44	.54
" "	V	.50	.22	.35	.62	.43	.38	.21	.00	.42	.47	.66	.35
" "	VI	.28	.14	.31	.16	.37	.25	.14	.29	.17	.14	.34	.21
" "	VII	.32	.64	.12	.46	.48	40	.28	.49	.76	.32	.29	.43
" "	Tot.	.74	.44	.53	.60	81	.62	.80	.39	.47	.60	.62	.58
" "	Sp.	.18	.44	.02	.25	.43	.27	.14	.18	.37	.17	.19	.21
IV and	V	.12	.55	.67	.41	.31	.41	.21	.11	.56	.17	.62	.34
" "	VI	.41	.33	.31	.28	.43	.35	.07	.00	.56	.36	.48	.30
" "	VII	.12	.18	.31	.22	.48	.26	−.07	.32	.42	.40	.34	.28
" "	Tot.	.92	.87	.94	.89	.73	.87	.84	.81	.95	.57	.86	.81
" "	Sp.	−.15	.02	−.02	.28	.06	.04	.21	.22	.37	.32	.13	.25
V and	VI	.32	.35	.35	.52	.54	.45	.00	.32	.56	.50	.44	.36
" "	VII	.15	.29	.26	.25	.13	.22	.07	.00	.05	.02	.29	.09
" "	Tot.	.35	.80	.84	.78	.73	.70	.35	.64	.65	.79	.69	.62
" "	Sp.	.15	.06	−.07	.00	.19	.07	−.21	.11	.37	−.06	.08	.06
VI and	VII	.25	.22	.12	.46	.13	.23	.07	.25	.11	.10	.03	.11
" "	Tot.	.47	.55	.61	.49	.88	.60	.42	.43	.73	.60	.80	.59
" "	Sp.	−.02	.14	−.12	.19	−.06	.03	.14	.00	.05	.06	−.08	.04
VII and	Tot.	.38	.22	.35	.28	.37	.32	.07	.32	.42	.21	.34	.27
" "	Sp.	.35	.22	.26	.38	.13	.27	−.07	.22	.22	.40	.08	.17
Tot. and	Sp.	.05	−.10	−.09	.28	−.06	.02	.14	.32	.37	−.02	.34	.23

Individual Correlations for Age Groups

The following array for the distribution of children by age shows the number of pairs of cases from which each coefficient of correlation is derived.

Number of Children in Each Age Group

Age	8 to 9–6	9–6 to 10	10 to 10–6	10–6 to 11	11 to 11–6	11–6 to 12	12 to 12–6	12–6 to 13	13 to 13–6	13–6 to 14	14 to 14–6	14–6 to 16	Total
Boys	14	13	32	52	63	38	59	37	39	14	15	9	385
Girls	20	23	36	45	54	39	55	38	34	12	6	10	372

TABLE LVI

Correlation of Each Test with Each of the Others, by Age

Boys

	8 to 9-6	9-6 to 10	10 to 10-6	10-6 to 11	11 to 11-6	11-6 to 12	12 to 12-6	12-6 to 13	13 to 13-6	13-6 to 14	14 to 14-6	14-6 to 16	Average
I-II and III	.78	.75	.92	.30	.46	.61	.53	-.04	.50	.78	.81	.50	.58
" " IV	.78	.89	.92	.40	.58	.33	.29	.13	.35	.32	.50	.50	.49
" " V	.78	.89	.88	.57	.54	.33	.19	.37	.35	.00	.50	.17	.44
" " VI	-.22	.57	.77	.35	.27	.08	.03	.45	.63	.63	.50	.50	.38
" " VII	.90	.57	.47	.62	.50	.33	.24	.13	.63	.22	.67	.50	.48
" " Tot.	.78	.89	.92	.66	.73	.48	.39	.59	.63	.78	.67	.77	.69
" " Sp.	.00	.33	.28	.40	.17	.40	.03	.59	.35	.22	.50	.77	.34
III and IV	1.00	.33	.93	.66	.80	.33	.34	.37	.43	.78	.67	.17	.57
" " V	.62	.33	.77	.06	.69	.55	.53	-.04	.58	.22	.91	.17	.45
" " VI	.00	.33	.63	.00	.37	.24	.66	.37	.69	.00	.31	.17	.31
" " VII	.90	.33	.47	.24	.58	.55	.29	.04	.58	.00	.98	.77	.48
" " Tot.	1.00	.33	.83	.35	.81	.55	.53	.37	.63	.63	.81	.50	.61
" " Sp.	.43	.57	.63	.46	.27	.00	.08	.21	.35	.00	.67	.50	.35
IV and V	.62	.89	.88	.30	.73	.67	.73	.59	.80	.43	.91	.17	.65
" " VI	.00	.57	.88	.35	.42	.67	.34	.29	.69	-.22	.67	.77	.45
" " VII	.90	.12	.47	.06	.54	.24	.34	.04	.80	-.62	.81	.77	.37
" " Tot.	1.00	.89	.98	.79	.96	.88	.98	.87	.89	.43	.81	.94	.87
" " Sp.	.22	-.12	.47	.35	.50	-.16	.03	.04	.28	.22	.67	.94	.29
V and VI	.43	.89	.71	.18	.69	.67	.62	.59	.89	.00	.67	.17	.54
" " VII	.62	.12	.71	.57	.58	.40	.34	-.21	.50	.00	.98	.17	.40
" " Tot.	.62	1.00	.96	.75	.90	.92	.86	.72	.89	.62	.81	.50	.79
" " Sp.	-.22	-.12	.00	.52	.27	.00	.13	.04	-.04	.43	.67	.50	.18
VI and VII	.00	-.34	.56	.00	.42	.40	.39	.21	.80	.22	.50	.17	.28
" " Tot.	-.43	.89	.88	.79	.58	.79	.53	.66	.95	.43	.50	.94	.63
" " Sp.	-.43	-.12	.20	.00	.08	.17	-.03	.37	.28	.00	.67	.94	.18
VII and Tot.	.91	.12	.63	.40	.62	.40	.53	.21	.80	.00	.91	.50	.49
" " Sp.	-.22	.33	.00	.57	.32	.48	.66	-.28	.43	-.22	.50	.50	.25
Tot and Sp.	.22	-.12	.28	.30	.42	.00	.13	.21	.28	.43	.50	1.00	.30

TABLE LVII

Correlation of Each Test with Each of the Others, by Age

Girls

	8 to 9-6	9-6 to 10	10 to 10-6	10-6 to 11	11 to 11-6	11-6 to 12	12 to 12-6	12-6 to 13	13 to 13-6	13-6 to 14	14 to 14-6	14-6 to 16	Average
I-II and III	.45	.67	.42	.31	.45	.63	.31	.24	.09	.71	-.50	.31	.34
" " IV	.45	.91	.57	.67	.68	.43	.47	.17	.18	.71	.87	.31	.53
" " V	.16	.78	.09	.67	.67	.75	.61	.40	.18	.87	.50	.57	.52
" " VI	.45	.34	.17	.62	.55	.50	.56	.67	.00	.26	-.87	-.31	.25
" " VII	.59	.20	.34	.44	.45	.12	.03	.17	-.18	.71	.00	1.00	.32
" " Tot.	.71	.78	.77	.85	.84	.75	.61	.67	.18	.71	1.00	.59	.70
" " Sp.	.31	.07	.34	.67	.17	.20	.14	.17	-.18	.00	.87	.31	.25
III and IV	.81	.58	.71	.07	.29	.58	.26	.33	.36	.87	.00	.81	.47
" " V	.00	.34	.09	.17	.34	.28	.42	.40	.00	.71	.50	.95	.35
" " VI	-.59	.58	.00	.24	.17	.04	.26	.24	.09	.00	.00	.81	.16
" " VII	.16	.46	.57	.17	.84	.35	.14	.33	.00	.50	.87	.31	.39
" " Tot.	.16	.78	.57	.31	.45	.60	.52	.40	.00	.50	-.50	.95	.40
" " Sp.	.16	.07	.09	.17	.23	.28	-.09	.17	-.18	.26	.00	-.31	.07
IV and V	.59	.67	.34	.56	.64	.69	.56	.33	.74	.71	.00	.95	.56
" " VI	-.31	.20	.26	.37	.39	.43	.36	.61	.36	.50	-.50	.31	.25
" " VII	.16	.07	.26	.44	.60	.20	.52	.55	.09	.50	.50	.31	.35
" " Tot.	.95	.78	.91	.77	.92	.92	.66	.74	.85	.87	.87	.95	.85
" " Sp.	.16	.20	.57	.56	.45	.58	.26	.24	.45	-.26	.50	-.31	.28
V and VI	.00	.20	.42	.62	.60	.58	.81	.48	.53	.71	.87	.59	.53
" " VII	.45	.34	.09	.17	.45	.04	.42	.33	.45	.71	.00	.59	.34
" " Tot.	.81	.67	.57	.01	.84	.95	.67	.85	.97	.50	1.00		.80
" " Sp.	.16	.20	.26	.17	.40	.80	-.09	.48	.27	.00	.87	.00	.29
VI and VII	.45	.46	-.17	.37	.50	.20	.42	.61	.36	.50	.50	-.31	.32
" " Tot.	.00	.67	.64	.72	.55	.43	.81	.88	.67	.87	-.87	.59	.50
" " Sp.	.16	-.07	.34	.38	.45	.80	-.09	.17	.53	-.26	-.50	-.31	.13
VII and Tot.	.45	.34	.34	.31	.55	.04	.36	.61	.60	.50	.00	.59	.39
" " Sp.	.00	.07	.26	.31	.34	.20	.26	.67	.45	.26	.50	.31	.30
Tot. and Sp.	.45	-.07	.64	.56	.50	.58	-.09	.17	.53	-.26	.87	.00	.32

A comparison of averages for the two forms of distribution will reveal the fact that the coefficients for the age grouping are almost uniformly higher than are those for the school grade grouping. Of the 28 relationships, 25 for the boys and 19 for the girls are higher for the age distribution. This is as one should expect—the age distribution is much more nearly a natural distribution than the grouping resulting from a selection on the basis of school grade. Artificial selection produces groupings in which normal results, reckoning humanity in general, tend to be much disturbed.

That the averages may be easily compared, these are conveniently arranged in the following table.

TABLE LVIII

AVERAGES OF COEFFICIENTS OF CORRELATION BY GRADE, BY AGE, AND FOR BOTH GRADE AND AGE

			Boys—385		Girls—372		Total—757
			By Grade	By Age	By Grade	By Age	By Grade and Age
I–II and		III	.39	.58	.32	.34	.41
"	"	IV	.33	.49	.31	.53	.42
"	"	V	.21	.44	.17	.52	.33
"	"	VI	.10	.38	.31	.25	.26
"	"	VII	.18	.48	.08	.32	.26
"	"	Tot.	.38	.69	.58	.70	.59
"	"	Sp.	.16	.34	.20	.25	.24
III and		IV	.55	.57	.54	.47	.53
"	"	V	.38	.45	.35	.35	.38
"	"	VI	.25	.31	.21	.16	.24
"	"	VII	.40	.48	.43	.39	.45
"	"	Tot.	.62	.61	.58	.40	.55
"	"	Sp.	.27	.35	.21	.07	.22
IV and		V	.41	.65	.34	.56	.49
"	"	VI	.35	.45	.30	.25	.34
"	"	VII	.26	.37	.28	.35	.32
"	"	Tot.	.87	.87	.81	.85	.85
"	"	Sp.	.04	.29	.25	.28	.21
V and		VI	.45	.54	.36	.53	.47
"	"	VII	.22	.40	.09	.34	.26
"	"	Tot.	.70	.79	.62	.80	.73
"	"	Sp.	.07	.18	.06	.29	.12
VI and		VII	.23	.28	.11	.32	.24
"	"	Tot.	.60	.63	.59	.50	.58
"	"	Sp.	.03	.18	.04	.13	.09
VII and		Tot.	.32	.49	.27	.39	.37
"	"	Sp.	.27	.25	.17	.30	.25
Tot. and		Sp.	.02	.30	.23	.32	.22

Age Differences Within the Grades

To discover whether the correlation of the youngest pupils differed from that of the oldest within given school grades, the youngest 25 per cent. and the oldest 25 per cent. respectively in each of the three A grades were correlated. The number of pairs of cases for each correlation in each case was 51 for the boys and 52 for the girls. For the boys, the results gave 15 of the 28 coefficients higher for the younger group; for the girls, 19 of the 28 are higher for the older group. The difference for the boys is too small more than to suggest a possible tendency toward higher correlation for the younger group. For the girls, however, the tendency toward greater correlation for the older group is sufficiently pronounced to be considered significant.

To compare the youngest 25 per cent. and the oldest 25 per cent., respectively, with the median 50 per cent., coefficients of correlation were derived for these groups from the pupils of grade 5A, in which there were 65 boys and 58 girls. The table following shows the results.

TABLE LIX

COEFFICIENTS OF CORRELATION FOR AGE GROUPS OF GRADE 5A

		Boys Youngest 25%	Median 50%	Oldest 25%	Girls Youngest 25%	Median 50%	Oldest 25%
I–II and	III	.91	.24	−.31	.67	.00	.10
" "	IV	.91	.47	−.67	.91	.62	.50
" "	V	.67	.24	−.10	.31	.00	.67
" "	VI	−.10	.31	−.10	.31	.53	.10
" "	VII	.67	.31	.10	.31	.33	−.31
" "	Tot.	.81	.59	−.31	.67	.78	.50
" "	Sp.	.50	−.21	.67	.67	−.11	.31
III and	IV	.67	.50	.31	.91	.33	.67
" "	V	.31	.31	.50	.67	.22	.50
" "	VI	−.10	.74	.10	.31	.11	.31
" "	VII	.31	.00	−.10	−.67	.85	.67
" "	Tot.	.50	.50	.31	.91	.00	.67
" "	Sp.	.10	.10	−.31	.67	−.11	.50
IV and	V	.67	.67	.50	.31	.43	.50
" "	VI	.31	.47	.81	.31	.53	.31
" "	VII	.31	.47	.67	.67	.53	.31
" "	Tot.	.98	.91	.91	.67	.97	.91
" "	Sp.	.50	−.10	−.31	.31	.11	.10
V and	VI	−.10	.47	.67	.31	.53	.50
" "	VII	.31	.47	.50	−.10	.33	−.31
" "	Tot.	.91	.81	.81	.91	.43	.81
" "	Sp.	.10	−.10	−.10	.31	.33	.31
VI and	VII	−.10	.31	.50	.31	.22	−.31
" "	Tot.	.10	.74	.98	.67	.71	.31
" "	Sp.	.10	−.21	.31	.31	−.22	−.31
VII and	Tot.	.10	.50	.67	.31	.33	−.10
" "	Sp.	.50	.24	.10	−.10	.00	.50
Tot. and	Sp.	.31	−.31	.10	.67	.11	.50

The median age of each group of the children in grade 5A is as follows:

		Boys	Girls
Youngest	25%	10 yrs.–2.50 mo.	9 yrs.–10.50 mo.
Median	50%	11 yrs.–4.25 mo.	11 yrs.– 3.22 mo.
Oldest	25%	13 yrs.– .50 mo.	12 yrs.– 6.50 mo.

Of the 28 sets of coefficients, for the boys 15 are higher for the youngest 25 per cent. than those of the median 50 per cent., 9 are lower, and 4 are the same; of the oldest 25 per cent., 11 are higher than those of the median 50 per cent., 14 are lower, and 3 are the same. The corresponding values for the girls are, of the youngest 25 per cent. 15 higher and 13 lower; of the oldest 25 per cent. 12 higher and 16 lower. The results indicate a tendency to correlations slightly higher for the youngest 25 per cent. than for the median 50 per cent., and slightly lower than the median 50 per cent. for the oldest 25 per cent. In median ability, the highest for both sexes is for the youngest 25 per cent., next for the median 50 per cent. by age, and the lowest for the oldest 25 per cent. The pupils in this grade with the most marked tendency toward extreme variation in ability vary in the direction of high ability more largely than toward low ability, and a larger proportion of these are found in the youngest 25 per cent. than in the oldest 25 per cent. The tendency toward higher correlation in those of extreme ability, as demonstrated in the following section, affords one factor in the explanation of the results shown in the foregoing table.

Relative Correlation of Those of Median and Extreme Total Ability

To compare the results of the children of lowest total ability with those of median and highest total ability, the ten per cents. making respectively the lowest totals, the median totals, and the highest totals were correlated. The six groups of 38 children each distribute in median age as follows:

		Boys	Girls
Lowest	10%	11 yrs.–6.0 mo.	11 yrs.–8.4 mo.
Median	10%	11 yrs.–6.0 mo.	11 yrs.–3.0 mo.
Highest	10%	11 yrs.–7.5 mo.	12 yrs.–0.0 mo.

By grades, the distribution of children is shown by the following array:

Grades	Boys Lowest 10%	Boys Median 10%	Boys Highest 10%	Girls Lowest 10%	Girls Median 10%	Girls Highest 10%
4A	28	4	2	21	10	1
5B	4	9	3	7	10	1
5A	5	9	1	6	6	3
6B	1	12	17	2	10	13
6A	0	4	15	2	2	20

TABLE LX

COEFFICIENTS OF CORRELATION FOR THE TEN PER CENTS. LOWEST, MEDIAN, AND HIGHEST IN TOTAL ABILITY

		Boys Lowest 10%	Boys Median 10%	Boys Highest 10%	Girls Lowest 10%	Girls Median 10%	Girls Highest 10%
I–II and	III	.17	−.17	.24	.00	.33	.08
" "	IV	−.08	.24	.33	−.40	−.08	−.08
" "	V	.08	−.17	.17	.00	−.40	.40
" "	VI	−.17	−.33	.00	.33	−.33	.08
" "	VII	.17	.17	−.24	.61	−.33	−.24
" "	Tot.	−.17	.55	.61	.17	.00	.61
" "	Sp.	.24	.08	.61	.33	.24	.33
III and	IV	−.17	.08	.33	.61	.74	.55
" "	V	−.17	−.67	.00	.08	−.61	.08
" "	VI	.24	.08	.17	−.24	−.55	−.33
" "	VII	.67	.17	.55	.40	.08	.24
" "	Tot.	.67	.00	.33	.55	.48	.00
" "	Sp.	.24	.00	.61	.24	.00	.48
IV and	V	−.24	−.61	−.17	.00	−.55	.08
" "	VI	−.61	−.61	−.24	−.48	−.61	−.24
" "	VII	−.17	.17	.00	.00	.00	.24
" "	Tot.	.61	.08	.40	.67	.33	.17
" "	Sp.	−.24	.24	.55	−.17	.24	.33
V and	VI	.33	.08	−.40	−.24	.17	−.08
" "	VII	−.33	−.08	−.24	.40	−.17	.24
" "	Tot.	.00	.17	.08	.40	.00	.74
" "	Sp.	.24	−.33	.08	−.24	−.40	.17
VI and	VII	.40	.08	.00	.24	.24	−.08
" "	Tot.	−.24	−.48	.67	−.08	.08	.48
" "	Sp.	.33	.17	−.08	.40	−.17	−.48
VII and	Tot.	.24	.17	.17	.55	.40	.17
" "	Sp.	.17	.33	.00	.24	.17	.00
Tot. and	Sp.	−.40	−.08	.55	.40	.17	.08

This distribution takes the children regardless of grade or age, selection being solely on the basis of total achievement in the tests, the totals here, as in all cases, not including spelling. The results for the 28 relationships are summarized as follows:

Cases in which the number of correlations for:	Boys	Girls
The lowest 10% is greater than for the median 10%..	17	20
The lowest 10% is less than for the median 10%......	9	6
The lowest 10% is the same as for the median 10%...	2	2
The highest 10% is greater than for the median 10%..	19	17
The highest 10% is less than for the median 10%.....	8	10
The highest 10% is the same as for the median 10%..	1	1
The lowest 10% is greater than for the highest 10%..	11	14
The lowest 10% is less than for the highest 10%......	17	12
The lowest 10% is the same as for the highest 10%...	0	2

Very markedly the relationships between capacities in those of extremes in ability, either high or low, are greater than in those of median ability, as shown by these tests. By comparison of the extreme groups, it is seen that the tendency is about the same in both for girls, but for boys there is a tendency to higher correlation in the group of greatest ability.

In absolute value, it is to be noted that the relationships for these groups selected on the single basis of total ability are very much lower than those for either grade or age groups. Every grouping used in these tests tends to verify the generalization that the more remote a selected group is from a natural distribution the lower the correlation of abilities.

Summary for Individual Correlations

Degrees of Correlation among the Several Tests

The coefficients for the relationships among the several tests in individuals for reasoning abilty are all sufficiently high to establish still more fully than the group relationships that they are all tests of one species of mental ability, though this be a very complex ability. While the gross coefficients are often high, it is always to be remembered that the true coefficients, those derived from adequate correction, would be considerably higher, reaching 1.00 or perfect correlation in a number of the tests as shown by the corrections for grade 6A, Table LIV.

The highest coefficients, as shown by the averages, Table LVIII, are, in their order, that for tests III and IV, the two forms of controlled association, completing sentences and the opposites, .53; that for tests IV and V, the opposites and the selection of reasons in one of the tests in selective judgment, .49; that for tests V and VI, the two tests in selective judgment, .47; and that for tests III and VII, controlled association and interpretation of the poems, .45. By correction, these would probably all be raised to above .75, those for III and each of the others approaching 1.00 very closely. Among the lowest of the average coefficients are those of tests III and VI, controlled association and the second test in selective judgment, .24, and for tests VI and VII, selective judgment and interpretation of the poems, .24. Relatively, the correlations with spelling are all low, the highest, .25, being with test VII, interpretation of the poems,

next in order, .24, that with the mathematical tests, then .22 with III and .21 with IV, the two forms of controlled association tests. The lowest coefficients for spelling are .09 with test VI, and .12 with test V, the two tests in selective judgment. The highest correlations for spelling are with those tests involving most the linguistic forms of ability and with the mathematics tests, the lowest with those involving selective judgment. In these facts, there may be food for reflection relative to the question of the disciplinary conception of education.

In the correlation of each test with the totals for all in reasoning ability, is represented a gross kind of comparison of the tests with reference to their individual validity as measures of any general species of mental ability of which they are varieties. In their order, from highest to lowest, these coefficients are: Totals with IV, the opposites test, .85; with V, a selective judgment test, .73; with I-II, mathematics tests, .59; with VI, a selective judgment test, .58; with III, a controlled association test, .55; with VII, the test in interpreting poems, .37; and with spelling, .22. The opposites test seems to be a test of rather superior merit as a single test for this general form of mental ability. Test V, the second in order, is the test in selective judgment involving the selection of valid reasons for a given condition from among a number which are erroneous or irrelevant, a test, in the writer's judgment, most nearly typical of all of these tests of the kind of problems most frequent in the everyday affairs of life. The mathematics tests stand third in this series. Tests III, VII, and spelling, at the bottom of the series, are somewhat alike in that they all have to do with some form of linguistic ability, in part.

Grade Differences in Correlation

An examination of Table LV will indicate that the coefficients for higher grades are, in general, slightly higher than those for lower grades. More definitely to determine the relative degree of correlation, a comparison was made of the averages of the coefficients for grades 4A and 5B taken together with those of grades 6B and 6A taken together. Of the 28 relationships, 16 for both boys and girls are higher in the upper grades. In the mathematical tests with each of the others, the lower grades are

higher in every case but one for each sex. For test III and the opposites, IV, and the opposites and the totals, the lower grades are higher for both sexes.

Probably the children of the upper two grades taken together represent more nearly a normal distribution of children than do the lower two, even though the upper grades do represent more select groups from certain standpoints. The age range of the upper grades taken together is considerably greater than that of the lower grades. This factor explains, at least in part, the higher correlation of the upper grades. Perhaps also the relative number of those rather extreme in ability in both directions is enough greater in the upper grade groups to influence the result in the direction of greater correlation.

Age Differences in Correlation

From the results derived from the correlation of the youngest and the oldest 25 per cents. of the three A grades, and from the more complete analysis of grade 5A, Table LIX, it is evident that there is a tendency toward correlation slightly higher for the youngest pupils than for those of median age, and slightly higher for those of median age than for the oldest pupils in these groups of children. Here again we may at least partly account for these facts on the basis of selection. The youngest pupils represent most nearly a natural distribution, those of median age stand next in this particular, and the oldest group show the greatest influence of selection.

Differences between Grade and Age Distributions

As will be revealed by a study of Table LVIII, 25 of the 28 relationships are higher by the age distribution than by the grade distribution for boys, and 19 for the girls. The age distribution is much more nearly a natural one. An age grouping aggregates all degrees of native ability while a grade distribution tends toward a uniformity in certain abilities, the tendency being to eliminate extremes in the direction of either inferior or superior ability. The more nearly natural the group in its components the higher will be the tendency toward correlation.

Sex Differences in Correlation

Comparing the averages of all of the children, Table LVIII, as distributed by grade, the boys are higher in 21 of the 28 relationships; as distributed by age, the boys are higher than the girls in 20 of the 28. As a whole, there is therefore a definite tendency toward higher correlation among the boys than among the girls.

Bearing of Results upon the Relation of Native Ability and Training

The correlations among these several phases of ability for children of these grades seem to be more largely tests of native relationships than of acquired. If this were not true, the correlations on the basis of age would not be so significantly higher than those on the basis of grades; and the upper grade correlations would be more markedly higher than those of the lower grades. This conclusion is further supported by reference to the age distribution of those who make up the 10 per cents. lowest and highest, respectively, in total ability. The median age of the poorest 10 per cent. of boys is 11 yrs. 6 mo., of the best 10 per cent. 11 yrs. 7.5 mo.; of the poorest 10 per cent. of girls 11 yrs. 8.4 mo., of the best 12 yrs. These groups, differing so little in age, yet differing in ability from three hundred to three thousand per cent., are certainly tested more largely upon native ability than upon school training. Even if the group of highest ability are more largely in the upper grades and that of the lowest ability in the lower, the very small difference in age enforces the inference that the relative showings made are more largely based upon differences of ability than upon other circumstances controlling promotion. The higher ability is the cause of the majority of the better group's being in the upper grades, and not their being in the upper grades the cause for the better showing in ability.

Now, since these tests do so extensively measure differences in native ability, and, since in these qualities making up intellectual ability such a high correlation is found, and bearing in mind the age of the pupils tested, is it not fair to infer that this correlation is a measure of relative degrees of native ability of the several forms and not of one phase of ability developed concomitantly as a by-product of some other phase? Specifically,

these children had had almost no training in the exact type of
problems, as set, in the opposites test and in the form of selective
judgment of test V, yet these stand, in this order, in the highest
correlation to the total ability shown for all of the tests. Which
would seem more reasonable, to hold that these abilities have
been developed as by-products of the types of problems actually
used in school training, or that the results of the tests are
measures of native capacity for the activities required in these
problems? It is offered as a valid inference from the results
here derived that, probably, most of the high correlations found
between functions, the one of which is attributed to concomitant
or resultant development of the other, are rather measures of
different phases of native ability, each with its own particular,
and in some measure unique, form of activity, the two having
a high initial correlation.

A bit of evidence, interesting in this connection, is involved
in the correlations for spelling and some of the other tests. It
has already been mentioned that the highest correlations with
the spelling test are with the tests of a somewhat linguistic
nature and with the mathematics tests. The coefficient for
spelling with the mathematics tests is next to the highest of that
of any test with spelling; further, the coefficients for the mathe-
matics tests are higher for the relationship with tests III and IV,
the filling of the blanks and the opposites tests, than for the
relationships with any of the other tests. That is, the correla-
tion for the mathematics tests and tests III and IV is high; the
correlation of the spelling test and test III and IV is high;
and the correlation of the mathematics tests and the spelling
test is high. These high correlations suggest a similarity among
these three types of problems rather more pronounced than is
usually assumed. They indicate that they involve processes of
association that are more alike than are those of the mathe-
matical problems and selective judgment, or the somewhat lin-
guistic problems of tests III and IV and selective judgment, or
of spelling and selective judgment. That the forms of mental
ability required in the three types of problems have some ele-
ments of close similarity is a fair inference. But this is very
different from saying that the abilities involved are the *same*.
To say that the ability used to solve problems in arithmetic
is more like the ability used to spell than it is like that used in

selective judgment of the type in test V is not at all to say that the ability used in solving arithmetic problems is the *same* as that used in spelling, nor that training resulting in increased ability to solve arithmetic problems will increase the ability to spell.

Much remains to be done in the analysis of mental processes before the limits of correlation and the causal connections involved in correlation can receive final evaluation. But correlations of abilities through correlations of results of mental tests are themselves an excellent means of analysis for the isolation of processes in complex activities. Refined forms of application are possible which point toward a more nearly final analysis of these isolated processes.

Summarized Conclusions for Individual Correlations

The following conclusions and deductions seem to be justified with reference to the 757 children on the basis of the results from these tests. In the measure in which these children are typical and these tests valid, these conclusions will apply to children in general.

Among these several varieties of reasoning ability, there is sufficiently high correlation further to verify the conclusion that they are all of one general species of ability, complex though it is.

The best test among those here used for this general ability is test IV, that of the opposites, the next that of the form of selective judgment in test V, and third, tests I-II, the mathematics tests. The poorest is test VII, the interpretation of the poems.

Children distributed on the basis of age show a correlation considerably higher than children distributed on the basis of school grade.

Children extreme in ability, either in the direction of poorness or excellence, show higher correlation than children of median ability.

There is slightly higher correlation among boys than among girls in the abilities measured by these tests.

The results here derived point to the conclusion that the correlations among the abilities here tested are a matter of native capacity rather than the result of training.

APPENDIX

Results for the Spelling Test

While spelling does involve a form of controlled association, it is of a type so different from that involved in the solution of new problems that it is not regarded as a test of the same species of ability as that measured by the other tests of this study. It is included here because of the opportunity offered for comparison and as a basis for correlation.

TABLE LXI

Frequency of Abilities by Grades

Ability	4A B	4A G	5B B	5B G	5A B	5A G	6B B	6B G	6A B	6A G
13	1									
19				2	1					
20	1									
21	1			1				1	1	
22		3	1				1			
23	1	6	2				1	1		
24	7	3	3	1	2		2		1	
25	4	5	4	2	4	1	3	1	2	
26	7	4	6	7	7	2	1		4	1
27	9	12	18	10	3	7	3	4	4	2
28	18	16	14	14	14	9	13	6	3	7
29	24	14	17	27	20	13	34	21	11	17
30	20	25	14	22	14	26	40	47	24	32
Cases	93	88	79	86	65	58	98	81	50	59

TABLE LXII

Median Ability and Variability for Each Grade

Grade	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
4A	27.86	27.68	.18		1.36	1.52	.048	.055
5B	27.39	28.22		.83	1.23	1.22	.045	.043
5A	28.07	28.77		.70	1.56	.97	.055	.033
6B	28.73	29.13		.40	.68	.61	.023	.020
6A	28.99	29.08		.09	1.15	.73	.039	.025

Combining the Half Years of Grades 5 and 6:

Grade	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
5	27.73	28.49		.76	1.39	1.09	.050	.038
6	28.86	29.10		.24	.91	.67	.031	.023
For all	28.24	28.63		.39	1.17	1.01	.041	.035

Per Cent. of Each Grade Reaching the 75 Per Centile of All

Grade	4A	5B	5A	6B	6A
Boys	21.50	17.71	21.49	40.81	48.00
Girls	28.40	27.79	44.82	57.99	54.20

Notable in this selected group are the uniform superiority of the girls, and the decline in ability for both boys and girls in grade 5B. The decline appearing in this group for tests V and VII for both boys and girls, and in test IV for girls, is in grade 5A, not in 5B as here.

Sex Differences by Grades

Per Cent. of Boys Reaching the 50 Per Centile of the Girls

Grade	4A	5B	5A	6B	6A
Per Cent.	53.30	34.50	28.60	35.50	44.10

In grade 4A only are the boys superior to the girls. The greatest superiority of the girls is found in grade 5A.

TABLE LXIII

Frequency of Abilities by Ages

Ability	Age 8–10 B	G	10–11 B	G	11–12 B	G	12–13 B	G	13–14 B	G	14–16 B	G
13					1							
19				2	1							
20							1					
21			1	1			1	1				
22				2				2		1		
23		3	1	1	1	1	1		2	1		
24	1	1	1	1	5	1	4		1	1	2	
25	1		2	3	4	3	5	2	3	1	2	
26	1	1	7	4	4	7	6	1	6		1	1
27	6	2	8	7	6	13	13	8	2	3	2	2
28	6	4	12	15	10	13	14	12	15	5	5	3
29	6	15	29	17	27	16	27	26	12	14	6	4
30	6	17	22	30	42	38	24	41	12	20	6	6
Cases	27	43	84	81	101	93	96	93	53	46	24	16

TABLE LXIV

Median Ability and Variability for Each Age

	Age	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
8	to 9	27.00	30.00		3.00	.50	.83	.002	.027
9	" 9-6	28.40	28.75		.35	.50	.96	.017	.033
9-6	" 10	26.70	28.77	2.07		.91	.57	.034	.019
10	" 10-6	28.10	28.25		.15	1.07	1.06	.038	.037
10-6	" 11	28.42	28.50		.08	.98	1.17	.034	.041
11	" 11-6	28.70	28.22	.48		1.14	1.31	.039	.046
11-6	" 12	28.66	28.78		.12	.87	1.25	.033	.043
12	" 12-6	28.19	28.75		.56	1.24	.95	.043	.033
12-6	" 13	27.91	28.83		.92	1.30	.72	.046	.025
13	" 13-6	27.87	28.60		.73	.92	.92	.033	.032
13-6	" 14	26.66	29.14	2.48		.79	.53	.029	.018
14	" 14-6	27.62	28.50		.88	1.04	.87	.037	.030
14-6	" 15	29.83	28.50	1.33		2.33	.75	.078	.026
15	" 16	29.00	28.50	.50		.75	1.27	.026	.044

Combining Half Years and Smaller Groups:

	Age	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
8	" 10	27.75	28.70		.95	1.12	.71	.040	.024
10	" 11	28.31	28.38		.07	1.02	1.12	.036	.039
11	" 12	28.68	28.46	.22		1.03	1.30	.035	.046
12	" 13	28.11	28.84		.73	1.26	.83	.044	.028
13	" 14	27.83	28.78		.95	1.13	.76	.040	.026
14	" 16	28.11	28.50		.39	1.25	1.00	.044	.035

Combining Further the Extreme Groups:

	Age	M's Boys	M's Girls	Higher Boys	Higher Girls	Q's Boys	Q's Girls	Co'ts. of Var. Boys	Co'ts. of Var. Girls
8	" 11	28.21	28.53		.32	1.09	1.04	.038	.036
13	" 16	27.87	28.72		.85	1.68	.86	.060	.003

Per Cent. of Each Age Group Reaching the 75 Per Centile of All

Age	8-11	11-12	12-13	13-16
Boys	25.22	43.56	24.98	23.36
Girls	37.89	40.85	33.32	41.91

In general, the foregoing arrays show the superiority of the girls in all age periods excepting that of the year 11 to 12, where the boys are slightly superior, and in the small groups from 14 to 16 where the boys are also superior. From 11 to 12 there is an especially marked rise in ability for the boys for the highest quartile. With the exception of this rise from 11 to 12, the percentage of boys in the highest quartile for all diminishes from the period 8-11 to 13-16.

Comparison of Youngest and Oldest 25 Per Cents. of the A Grades

TABLE LXV

<small>YOUNGEST AND OLDEST PUPILS OF THE A GRADES COMPARED</small>

Boys

Grade		Median Age Yrs.	Mo.	M's	Higher Younger	Older	Q's	Co'ts. of Var.
4A	Younger 25%	9	8.0	27.71			1.06	.038
	Older "	12	9.5	27.75		.04	1.50	.054
	Whole Grade	11	.5	27.86			1.36	.048
5A	Younger 25%	10	2.5	28.30			1.15	.040
	Older "	13	.5	27.37	.93		1.20	.043
	Whole Grade	11	9.2	28.07			1.56	.055
6A	Younger 25%	11	1.5	29.00			1.75	.060
	Older "	14	5.5	29.00			.12	.004
	Whole Grade	12	4.0	28.99			1.15	.039

Girls

Grade		Median Age Yrs.	Mo.	M's	Higher Younger	Older	Q's	Co'ts. of Var.
4A	Younger 25%	9	4.0	28.60			1.44	.050
	Older "	12	3.5	27.40	1.20		2.41	.088
	Whole Grade	10	7.8	27.68			1.52	.055
5A	Younger 25%	9	10.5	29.06			.67	.023
	Older "	12	6.5	28.37	.69		1.48	.052
	Whole Grade	11	4.0	28.77			.97	.033
6A	Younger 25%	11	0.0	29.33			.33	.011
	Older "	14	6.5	28.66	.67		.95	.033
	Whole Grade	12	7.5	29.08			.73	.025

In grade 4A for the boys alone are the older pupils superior to the younger. The younger groups all exceed the median ability for the whole grade, in each case, excepting grade 4A for boys; the older boys of grade 6A also exceed the median for the grade as a whole. In every grade excepting 6A for the boys, the variability of the younger group is lower than that of the older.
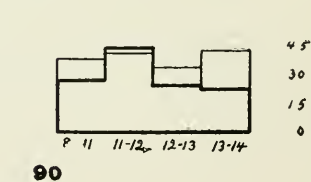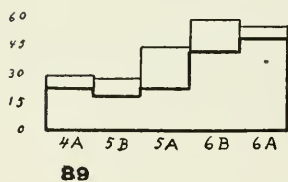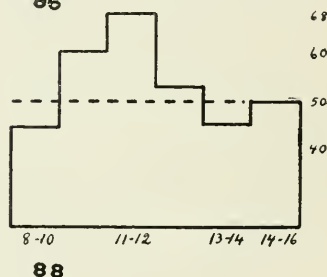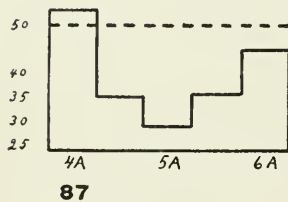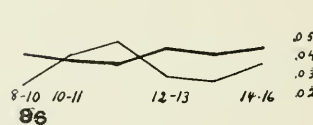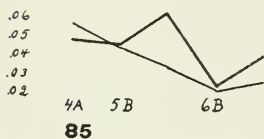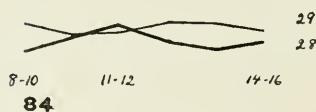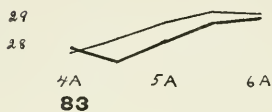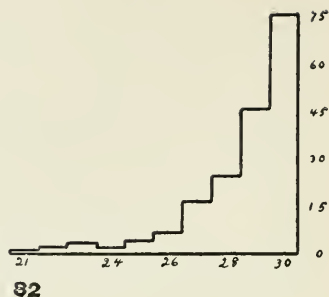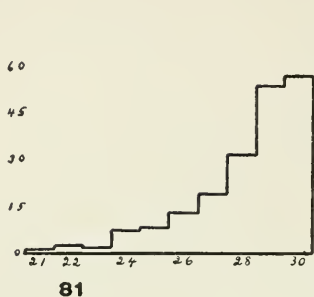
FIGURES 81–90.
SPELLING TEST

81. Frequencies of Abilities, Boys.
83. Median Ability, by Grades.
85. Variability, by Grades.
87. Per Cent. of Boys Reaching the 50
    Per Centile of Girls, by Grades.
89. Per Cent. of Pupils Reaching the 75
    Per Centile of All, by Grades.
    ————— Boys.

82. Frequencies of Abilities, Girls.
84. Median Ability, by Age.
86. Variability, by Age.
88. Per Cent. of Boys Reaching the 50
    Per Centile of Girls, by Age.
90. Per Cent. of Pupils Reaching the 75
    Per Centile of All, by Age.
    ————— Girls.

Sex Differences by Age

TABLE LXVI

PER CENT. OF BOYS REACHING THE 50 PER CENTILE OF THE GIRLS

For Half Years				Combining Half Years and Smaller Groups	
Age	Per Cent.	Age	Per Cent.	Age	Per Cent.
8 to 9	00.00	12 to 12–6	55.91	8 to 10	44.44
9 " 9–6	75.00	12–6 " 13	48.64	10 " 11	60.71
9–6 " 10	23.07	13 " 13–6	46.15	11 " 12	68.32
10 " 10–6	53.12	13–6 " 14	21.43	12 " 13	53.24
10–6 " 11	65.38	14 " 14–6	6.66	13 " 14	45.28
11 " 11–6	66.66	14–6 " 15	60.00	14 " 16	50.00
11–6 " 12	71.05	15 " 16	75.00		

In the age distribution, the superiority of the girls is not so marked as in the grade array. From about ten to about twelve, the boys are superior.

Summary for the Spelling Test

Grade Differences

There is progress from grade to grade in this test excepting for the slight drop for boys in grade 5B and for girls in grade 6A. The gain in per cent. from grade 4A to 6A is 4.05 for boys and 5.05 for girls. In the percentage of pupils from each grade who are found in the highest quartile for all, there are more from grade 4A than from 5B, for both boys and girls. After 6B, there is progress through the remaining grades. Variability is greater in the lower grades than in the higher.

Age Differences

The boys average slightly lower for the years above twelve than for the years below, while the older girls average a little higher than the younger. Excepting for the small groups from 14 to 16, boys make their best record from 11 years to 11 years 6 mo. Girls make their best record from 13 yrs. 6 mo. to 14 years. Of the three A grades, the youngest 25 per cent. stand higher than the oldest 25 per cent. in every case excepting for the boys of grade 4A. In the percentages from each group found in the highest quartile for all, that of the period from 11 to 12 is much the highest for boys. The percentage for the

period 8 to 11 is higher than that for from 12 to 13, and this higher than that from 13 to 16. For girls, the proportionate percentages are parallel excepting that for the period from 13 to 16 the percentage is highest of all, and that for every period the percentage of girls is higher than that of the boys. A rhythm in the half year array is quite apparent for boys with crests at 9 yrs., 11 yrs. 6 mo., and 14 yrs. 6 mo. For girls, there are small fluctuations with fairly prominent crests at 8 to 9 years, 12 yrs. 6 mo., and 13 yrs. 6 mo.

Sex Differences

In every grade but 4A, the median ability of the girls is higher than that of the boys. The relative superiority diminishes from grade 5B upward. In the age distribution the girls are also superior in every group excepting those from 11 yrs. to 11 yrs. 6 mo., and from 14 yrs. to 16 yrs. In every grade, the percentage of girls who reach the 75 per centile of the ability of all is larger than that of the boys. The same is also true of every age group excepting that from 11 to 12 years. In variability, the boys are a little higher, on the whole.

Comparison of Spelling Results with Those on Reasoning

Comparison of tables and of the graphical representations of general tendencies shows that the results for spelling most resemble those of test III excepting for the fall in ability of boys in grade 5B. In the percentage of each group reaching the 75 per centile, the test is also most like III. In sex differences as indicated by the per cent. of the boys reaching the 50 per centile of the girls, it is most like test VII. However, the test is not nearly so much like any of the other tests as they are like each other. The test is not nearly so adequate as the others in that too many of the pupils make a perfect grade in it. It is not difficult enough. Its value in relation to the other tests lies more in its possibilities for individual correlations than for group correlations.

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TABLE IV

Scores of Each Child in Each Test

Boys

Grade 4A

Child No.	Age Yrs.Mo.	I A	I B	II A	II B	III a	III b	III A	III B	IV A	IV B	IV C	V A	V B	V C	V D	VI a	VI b	VI A	VI a	VI b	VI B	VII A	VII B	Sp. A	Sp. B
School No. 2																										
1	14–0	8	6	4	4	3	5	8	9	21	27	22	1	0	1	0	−7	4	0	−5	−2	0	0	0	13	13
2	12–6	5	4	2	0	4	7	8	9	20	21	21	−1	2	−2	0	0	4	0	−5	2	0	0	0	15	12
3	13–0	5	0	2	2	0	0	0	7	5	4	12	1	0	−2	0	6	−1	3	4	3	3	0	0	13	15
4	10–9	6	6	6	0	5	8	5	9	21	25	25	0	−6	2	2	4	0	0	2	−6	2	1	1	15	15
5	11–9	1	2	8	0	6	6	7	6	9	17	14	3	0	2	6	0	2	0	0	2	3	2	1	14	15
6	11–0	6	0	10	6	5	6	7	9	19	33	24	−1	2	1	8	2	0	0	2	0	4	2	1	15	15
7	11–2	2	3	1	4	0	9	8	9	20	15	21	4	0	−1	2	0	0	0	0	0	9	1	0	14	15
8	13–0	8	1	8	0	3	4	6	8	19	30	0	0	6	2	2	2	0	3	2	3	6	0	0	15	13
9	11–0	6	6	4	2	4	9	7	8	2	20	19	1	0	4	2	0	0	0	0	0	0	0	0	15	13
10	12–0	9	4	8	2	0	6	8	8	24	24	26	0	0	−1	4	3	5	3	−5	−1	3	1	1	13	14
11	11–0	0	2	4	0	0	0	1	9	20	23	21	4	−2	4	0	0	7	0	−4	−1	0	0	0	14	15
12	10–8	9	0	0	0	0	10	9	8	4	8	0	7	4	0	0	2	0	0	1	−2	0	2	0	15	15
13	13–1	2	4	8	8	7	10	8	8	26	38	32	2	0	2	0	2	6	3	5	7	3	5	1	15	14
14	10–11	0	4	6	2	6	6	0	9	35	36	28	0	−7	4	6	2	2	0	1	−1	6	1	1	15	15
15	11–11	4	1	2	8	3	6	8	8	24	28	28	5	0	0	−2	2	0	6	−1	0	0	1	1	15	9
16	10–0	0	2	4		3	6	8	8	6	21	23	0	0		−7	−7	0	9	−7	−8	9	1	3	14	15
School No. 3																										
17	10–8	7	4	6	4	7	10	8	9	32	30	33	1	8	3	6	0	0	3	0	8	3	4	2	15	14
18	10–6	8	8	6	8	8	10	9	9	35	39	30	6	10	0	−2	6	8	3	8	−1	0	6	5	15	15
19	10–6	4	0	4	0	4	8	9	9	2	2	0	4	8	0	1	1	2	0	0	0	0	1	3	15	15
20	12–11	10	0	8	8	2	5	9	6	0	3	16	0	0	2	2	0	0	0	4	0	6	0	0	15	14
21	10–0	8	8	2	0	4	6	4	7	0	0	0	0	0	1	0	7	4	9	5	0	9	2	0	15	15
22	10–2	8	2	6	4	5	0	8	9	26	5	2	7	0	2	7	6	5	9	6	2	3	2	2	14	15
23	10–6	8	0	0	8	6	9	8	9	31	34	30	7	2	8	2	7	6	3	0	0	0	4	1	12	12
24	10–9	5	0	2	2	3	8	6	8	33	23	28	3	8	6	1	2	4	0	6	8	0	4	6	14	14
25	10–0	6	4	4	4	7	0	8	9	0	31	36	3	8	8	1	1	8	6	8	8	0	2	0	14	15
26	12–5	7	0	3	2	7	9	9	7	0	0	0	1	0	4	3	3	6	9	4	0	9	1	3	15	14
School No. 4																										
27	10–1	6	6	10	4	8	10	8	9	34	30	31	3	2	2	6	0	8	3	8	2	3	5	2	15	15
28	11–1	2	2	4	2	5	8	6	8	28	20	31	2	6	6	−2	4	−1	0	−1	2	0	5	2	12	11
29	10–1	4	5	8	2	9	10	9	9	36	25	38	5	10	10	0	0	8	0	8	0	0	2	3	15	15
30	12–1	5	0	8	4	4	0	7	7	25	29	31	3	4	4	2	3	2	3	4	4	3	0	1	13	11
31	10–1	0	0	4	8	3	9	6	8	0	3	6	3	0	0	1	0	−7	0	8	8	0	0	0	13	9
32	11–2	4	5	8	0	7	2	9	8	36	31	29	0	10	0	0	4	4	0	0	0	0	0	1	14	12
33	12–2	3	0	0	4	7	0	8	9	25	25	27	0	2	0	2	2	2	3	8	8	9	5	5	15	15
34	12–3	8	6	8		8	8	9		38	37	36	6	10	5	0	0	0	0	8	8	9	1		15	15

TABLE IV—*Continued*

Child No.	Age Yrs. Mo.	I A	I B	II A	II B	III A a	III A b	III B a	III B b	IV A	IV B	IV C	V A	V B	V C	V D	VI A a	VI A b	VI A c	VI B a	VI B b	VI B c	VII A	VII B	Spelling A	Spelling B
School No. 4																										
35	12– 5	6	8	6	4	8	4	9	9	36	25	28	–2	0	1	0	0	–7	–2	0	0	0	1	1	14	13
36	11– 4	1	0	2	2	4	6	8	8	4	10	0	2	0	2	4	0	0	0	0	3	0	1	1	15	14
37	12– 8	2	0	0	0	4	8	8	7	17	10	15	5	–4	–1	8	4	0	2	3	0	1	5	5	10	10
38	10– 5	8	4	1	6	10	10	8	9	28	36	37	2	6	8	9	–6	7	–3	3	4	4	2	5	14	12
39	12– 1	4	6	6	4	6	6	6	9	16	20	24	4	4	5	2	0	–2	–2	0	0	3	1	2	14	15
40	12– 5	6	4	4	4	5	5	7	6	20	0	18	0	0	2	0	3	0	3	3	3	0	1	1	15	15
41	9–10	2	0	2	0	4	5	6	7	2	2	2	–9	0	–1	2	0	0	0	0	0	0	1	1	15	12
School No. 6																										
42	11– 3	2	2	2	2	10	0	8	8	6	4	11	–1	0	2	0	0	–3	–5	0	0	0	0	0	15	13
43	11– 8	8	0	6	0	5	4	8	8	6	32	29	0	0	0	2	3	–3	–2	3	4	3	3	0	15	14
44	11– 4	7	4	0	6	8	6	0	4	37	24	16	1	4	4	0	0	0	0	0	4	0	0	0	13	13
45	11– 0	2	0	2	0	8	8	9	0	22	24	21	–4	6	6	6	3	5	4	3	1	0	0	0	13	11
46	10– 1	4	0	4	2	8	5	0	9	27	34	31	2	0	0	4	0	2	1	0	4	3	0	0	13	15
47	9– 6	2	0	4	4	9	7	8	7	12	18	38	0	2	2	0	3	0	4	3	1	0	0	0	15	13
48	10– 1	4	2	6	8	0	6	8	8	10	2	0	1	0	2	2	0	2	5	3	6	0	0	0	14	15
49	11– 4	4	0	2	8	10	3	8	0	26	4	20	0	2	2	0	3	8	–1	3	3	0	1	1	14	13
50	10– 3	4	0	4	4	5	3	7	6	16	1	11	4	2	0	2	0	–3	–5	0	0	5	0	0	14	15
51	9– 0	2	0	0	2	8	8	0	0	25	23	25	2	2	2	0	0	5	5	6	2	0	0	0	14	15
52	10–11	6	5	2	2	8	7	8	8	5	27	25	–2	2	0	0	3	2	1	3	0	4	5	5	15	12
53	11– 2	4	4	4	4	3	5	0	0	3	20	3	2	0	6	0	0	–1	0	0	6	2	0	0	14	13
54	14– 1	2	2	6	2	4	7	5	0	31	4	31	3	6	2	2	3	7	2	3	3	0	0	0	14	15
55	10– 0	0	0	0	8	1	6	7	0	30	33	24	2	0	0	0	9	–2	–1	6	9	3	2	5	14	15
56	8– 6	4	0	2	8	4	8	8	8	9	2	2	–6	2	2	0	2	–5	0	3	6	3	1	0	14	14
57	10– 9	6	0	6	4	5	6	5	3	13	28	34	3	2	0	2	3	0	2	0	0	3	2	5	15	12
58	11– 1	3	0	6	4	4	8	0	4	15	10	31	2	6	4	4	7	7	4	0	0	0	1	0	14	12
59	10– 0	2	0	2	4	1	5	5	1	11	26	21	2	2	4	0	2	5	7	3	0	0	2	0	14	14
60	12– 2	4	0	0	0	4	5	0	7	33	29	21	–3	2	4	4	5	2	2	3	3	0	1	0	15	14
61	11–10	2	8	4	7	5	9	7	8	17	30	34	3	2	2	0	0	0	5	6	9	0	1	1	13	15
62	10–11	0	0	7	2	8	7	7	1	23	27	25	0	0	4	4	2	–1	–8	3	6	0	2	2	14	14
63	13– 0	6	2	2	8	0	9	9	7	17	21	24	1	0	0	0	5	–1	2	0	3	0	1	0	15	15
64	12– 3	4	8	8	8	8	8	8	3	12	24	32	–3	0	2	0	4	0	5	3	3	0	1	0	13	14
65	10–11	6	0	8	2	1	5	5	4	25	32	36	0	0	2	2	8	–8	–8	0	0	0	0	0	14	15
66	14– 8	4	4	8	4	7	0	0	0	4	33	12	2	2	0	0	5	2	5	3	3	1	1	1	15	14
67	11– 6	8	0	8	4	3	7	7	7	9	1	9	3	2	0	4	0	–5	–8	3	3	0	0	0	13	15
68	8– 0	8	4	8	6	4	6	6	3	4	19	—	2	2	6	2	4	–2	5	0	0	1	1	0	15	15
69	11– 2	8	0	4	6	4	7	7	4	9	—	9	3	0	2	0	4	–2	2	0	0	0	0	0	12	13
School No. 9																										
70	13– 6	0	0	6	2	8	7	6	8	15	22	19	2	–1	–2	0	3	–1	4	0	0	1	1	1	15	14
71	11– 1	6	2	0	4	2	7	7	2	9	23	25	0	0	–4	0	2	6	4	0	0	1	0	1	12	12
72	11– 8	8	4	6	2	2	5	9	2	23	38	32	2	4	4	2	9	0	4	0	0	1	1	1	13	11
73	9– 0	4	0	4	2	5	9	9	5	29	25	22	3	3	–1	0	0	0	0	0	0	0	1	1	13	15

School No. 3

Grade 5B

School No. 4

TABLE IV—*Continued*

Grade 5B

Child No.	Age Yrs. Mo.	I A	I B	II A	II B	III A a	III A b	III B a	III B b	IV A	IV B	IV C	V A	V B C	V C	V D	VI a	VI b	VI c	VI A a	VI A b	VI a	VI b	VI c	VII A c	VII A b	VII A a	VII B	Spell A	Spell B
School No. 4																														
117	12–0	6	6	4	6	5	6	0	6	33	33	26	0	0	0	0	0	0	3	0	1	1	14	14	13
118	11–4	6	6	6	6	5	6	0	6	28	28	21	3	4	1	2	3	3	0	1	3	15	15
119	9–11	8	4	8	10	6	10	0	3	25	29	31	4	8	9	6	0	7	3	0	12	15
120	9–7	8	6	8	0	3	0	10	7	31	35	34	8	0	0	2	0	7	2	3	13	15
121	10–6	8	6	8	8	9	9	9	8	31	35	23	0	0	4	4	0	4	3	0	14	14
122	10–2	6	6	6	2	7	9	0	0	37	35	33	5	0	7	8	4	3	0	7	14	13
123	9–6	8	8	8	8	8	9	7	6	36	35	36	4	0	3	6	3	2	3	0	13	15
124	12–6	6	8	4	8	0	0	0	3	25	33	0	3	0	0	0	3	4	1	0	11	13
125	12–0	4	6	6	2	7	7	3	0	1	0	0	1	0	4	4	0	4	3	2	13	14
126	10–0	8	4	8	6	0	10	0	9	28	28	30	6	0	3	8	8	2	1	1	15	11
127	13–0	0	6	0	0	7	9	7	2	16	14	33	1	4	0	2	2	2	0	0	14	14
128	12–0	6	4	8	6	6	0	6	7	0	0	16	0	2	0	4	2	7	2	6	15	15
School No. 6																														
129	10–8	10	2	8	2	5	8	6	5	15	23	20	1	2	1	2	3	5	4	1	13	12
130	12–0	6	8	4	4	3	6	2	4	27	27	30	1	2	1	2	0	3	1	3	15	15
131	13–5	6	4	0	6	2	9	4	6	27	30	29	1	6	6	6	3	7	1	6	13	11
132	11–1	8	2	6	2	4	5	6	6	17	17	34	5	4	3	3	0	7	0	3	13	12
133	10–6	8	4	8	6	8	7	4	6	22	30	31	2	0	2	2	6	1	0	3	14	13
134	13–1	8	4	6	4	2	0	2	4	2	2	14	1	4	9	8	4	8	0	2	14	13
135	11–5	2	6	0	6	2	5	2	8	25	26	20	3	10	0	6	8	8	5	0	15	15
136	13–7	2	2	0	0	3	5	0	8	24	26	28	4	10	1	0	0	0	2	0	15	15
137	10–11	6	4	2	8	2	8	9	8	33	15	18	2	2	0	0	0	4	3	0	13	12
138	9–11	10	6	10	8	5	0	5	8	29	20	36	6	8	5	4	3	0	1	0	14	14
139	11–8	8	8	9	2	4	0	8	6	30	31	32	1	6	9	8	4	2	1	0	14	13
140	12–0	6	6	6	0	2	5	0	8	5	32	26	0	6	5	8	8	3	2	0	14	14
141	13–2	6	2	0	0	5	5	0	8	20	26	12	7	8	5	4	4	0	3	0	14	14
142	13–8	0	8	4	4	7	7	0	7	31	21	28	2	6	1	6	0	8	3	3	14	13
143	9–7	2	2	0	0	4	0	3	0	18	26	30	2	0	5	4	0	4	3	1	15	11
144	13–6	1	6	0	6	0	0	8	8	25	26	29	4	0	1	8	3	0	0	1	14	13
145	10–5	1	8	10	4	8	8	9	8	20	21	22	5	0	2	2	0	0	0	1	15	14
146	13–0	5	3	8	2	8	0	6	7	26	26	36	1	2	0	4	0	2	4	1	14	12
147	11–10	0	3	4	6	8	8	0	7	20	21	28	2	4	2	4	3	3	1	0	14	14
148	11–0	2	1	2	8	2	6	7	0	23	26	31	5	2	0	0	3	5	0	1	15	12
149	13–9	1	6	7	6	5	0	7	8	18	28	23	2	0	2	0	0	0	0	0	12	14
150	11–3	1	3	4	6	7	8	0	0	28	23	20	3	0	0	7	3	7	4	0	15	15
151	13–3	5	1	0	6	4	0	3	4	15	29	2	0	2	1	7	6	0	1	0	14	12
152	10–10	0	6	3	6	4	9	4	4	23	19	20	5	0	5	0	2	3	1	0	12	14
153	13–0	2	3	4	6	1	6	7	8	27	36	26	3	0	9	7	8	3	0	0	15	14
154	13–10	7	4	7	6	3	7	0	4	25	30	20	0	0	1	0	0	3	4	0	14	12
155	11–2	2	6	10	0	4	9	1	8	23	18	16	3	0	2	6	5	5	1	0	15	14

School No. 9
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School No. 3
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Grade 5A

School No. 4
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School No. 6
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TABLE IV—*Continued*

Child No.	Age Yrs. Mo.	I A	I B	II A	II B	III A a	III A b	III B a	III B b	IV A	IV B	IV C	V A	V B	V C	V D	VI A a	VI A b	VI A c	VI B a	VI B b	VI B c	VII A	VII B	Spelling A	Spelling B

School No. 6

Grade 5A

(Child Nos. 199–216)

School No. 9

(Child Nos. 217–237)

Grade 6B

School No. 2
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School No. 3
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School No. 4
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TABLE IV—*Continued*

Child No.	Age Yrs. Mo.	I A	I B	II A	II B	III A a	III A b	III B a	III B b	IV A	IV B	IV C Grade 6B	V A	V B	V C	V D	VI A a	VI A b	VI A c	VI B a	VI B b	VI B c	VII A	VII B	Spelling A	Spelling B
School No. 4																										
281	13–1	4	6	0	2	7	8	9	8	10	26	26	0	0	0	0	0	0	0	0	0	0	0	0	14	14
282	12–6	6	8	8	10	8	8	8	8	22	31	38	0	8	9	8	2	4	6	9	7	1	0	0	14	15
283	13–1	4	6	6	6	0	8	9	8	26	37	36	1	0	0	6	4	5	0	9	1	4	1	1	15	14
284	11–10	4	4	6	6	9	0	9	8	36	31	36	0	2	9	8	8	1	0	9	4	2	2	1	15	14
285	10–9	2	5	6	6	7	10	9	9	16	24	34	3	4	2	4	0	5	0	0	7	5	6	4	15	14
286	13–7	4	5	8	8	0	10	9	6	25	29	36	0	6	4	2	6	0	6	7	0	1	0	1	13	13
287	10–8	6	4	6	0	5	5	9	9	34	37	36	2	8	4	6	6	1	5	3	2	5	7	4	14	14
288	12–2	4	5	0	2	10	8	9	9	32	31	30	1	8	2	6	0	2	0	7	0	1	3	5	15	15
289	13–5	4	3	6	0	7	0	9	8	33	29	23	8	8	9	8	3	8	3	9	2	2	0	5	14	15
290	12–11	4	8	0	1	8	7	9	8	29	24	37	0	4	7	8	3	3	8	0	1	5	0	5	14	14
291	11–4	2	2	4	6	8	8	8	9	37	35	39	5	8	5	8	3	0	3	6	4	2	3	3	15	15
School No. 6																										
292	12–5	10	8	10	10	8	7	9	9	25	28	36	3	8	6	8	3	3	5	7	7	5	7	4	14	15
293	12–10	8	6	8	0	5	8	9	8	33	33	39	3	2	0	8	2	2	1	3	8	1	3	1	15	14
294	11–1	0	3	8	0	8	8	9	9	39	33	40	5	2	9	4	3	3	4	0	2	2	2	2	14	15
295	11–5	0	4	2	1	3	6	9	9	32	27	37	0	2	1	2	3	3	3	3	4	1	0	0	15	14
296	12–1	0	2	6	0	7	8	8	0	26	29	25	5	2	0	8	3	0	6	6	3	1	0	2	14	15
297	12–1	4	10	2	8	6	6	9	6	35	31	40	4	8	3	0	3	0	0	0	7	5	4	3	15	15
298	11–4	10	6	4	0	0	0	9	8	15	29	37	2	6	0	2	0	6	0	3	5	3	3	0	15	14
299	11–5	4	8	6	7	7	6	9	0	31	14	37	2	0	9	0	5	0	3	0	7	7	0	0	14	15
300	10–5	4	8	4	0	0	0	7	8	15	33	24	1	10	0	8	8	0	0	7	5	0	6	1	14	15
301	11–5	4	8	0	0	7	0	8	9	31	17	39	8	6	3	0	0	2	0	9	7	6	9	0	15	15
302	10–10	8	8	0	8	0	9	7	9	22	32	30	0	0	9	0	6	0	2	6	4	3	6	4	15	15
303	10–9	4	8	8	0	7	0	9	0	35	28	30	6	2	3	6	0	1	8	7	5	4	6	5	14	15
304	11–11	0	8	8	6	9	8	9	0	36	39	39	5	10	0	6	0	8	2	6	4	7	6	2	15	15
305	14–2	8	0	8	8	7	7	9	9	25	32	38	4	6	3	0	3	2	1	9	0	1	6	1	14	14
306	12–10	8	10	0	8	5	0	0	7	25	37	39	6	10	9	8	0	0	8	3	8	5	3	0	15	15
307	10–	2	10	0	8	8	9	8	9	33	32	37	2	4	1	2	3	4	3	9	3	2	6	0	15	15
308				2	4	8	0		0				–2	2	0	8	4				1	8	6	4	15	15
School No. 9																										
309	11–0	6	6	8	8	10	10	9	9	25	34	36	7	8	9	4	4	3	0	6	7	7	6	1	15	15
310	11–0	7	8	4	6	0	6	6	0	32	32	37	6	0	8	10	10	6	3	0	7	7	0	0	14	14
311	10–10	0	4	0	0	0	8	8	8	19	22	16	0	8	6	2	2	0	4	3	4	4	3	2	15	15
312	12–1	10	10	4	8	8	8	0	0	39	30	40	6	8	8	8	8	6	0	0	1	0	0	0	14	14
13	11–1	0	6	6	4	6	0	9	8	31	37	34	3	8	8	0	0	3	9	3	0	2	6	3	14	15
314	11–9	6	6	0	6	6	0	8	9	29	33	35	2	0	0	2	1	0	0	0	4	1	6	0	14	15
315	10–10	6	0	0	6	0	0	9	7	22	33	25	5	0	7	4	4	0	0	6	4	1	6	3	15	15
316	11–4	4	0	0	0	7	7	8	8	27	32	36	0	2	3	7	6	3	0	6	8	1	6	0	15	15
317	10–4	2	6	0	10	7	7	0	0	31	30	30	0	0	1	6	0	3	5	6	4	7	6	0	15	15
318	11–5	2	4	0	8	10	10	9	9	37	38	35	4	10	9	10	10	3	8	6	8	8	6	1	15	15

Grade 6B

School No. 9

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Grade 6A

School No. 3

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School No. 4

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TABLE IV—Continued

Child No.	Age Yrs. Mo.	I A	I B	II A	II B	III A a	III A b	III B a	III B b	IV A	IV B	IV C	V A	V B	V C	V D	VI A a	VI A b	VI A c	VI B a	VI B b	VI B c	VII A	VII B	Spelling A	Spelling B
School No. 6										**Grade 6A**																
364	11–6	10	4	6	6	7	10	9	9	37	32	31	6	10	9	8	5	3	6	4	–3	6	7	1	15	14
365	11–10	8	10	8	10	8	8	9	9	38	34	40	5	10	6	6	0	8	3	0	0	3	4	2	15	15
366	12–0	7	8	2	0	7	10	9	9	27	33	32	5	10	9	6	5	7	3	2	3	3	3	1	15	15
367	12–5	4	8	0	0	7	10	9	8	35	32	35	0	10	1	0	0	0	0	0	0	0	1	6	14	15
368	11–2	4	6	4	4	10	10	8	6	38	32	37	–2	2	0	0	–2	–2	0	0	0	0	7	3	15	15
369	12–5	8	4	8	8	8	10	8	6	26	16	20	8	0	8	6	0	6	3	0	7	3	0	1	12	15
370	12–3	8	8	2	2	8	10	9	9	31	34	39	0	10	8	8	6	0	0	7	7	6	5	1	15	12
371	12–2	10	6	8	8	7	9	9	7	37	29	30	7	6	8	6	0	6	3	1	2	3	0	1	15	15
372	12–1	4	2	4	4	6	6	6	8	36	26	36	5	4	3	6	8	0	6	1	7	6	5	8	15	15
373	11–5	4	6	8	8	0	7	7	0	28	32	29	5	8	0	4	0	5	0	8	4	3	9	5	15	15
374	14–6	10	8	10	10	7	9	8	8	34	31	37	0	6	0	8	5	0	0	–3	1	0	1	2	15	15
375	11–7	8	6	6	8	9	9	7	3	33	34	38	5	6	9	0	4	4	0	8	3	6	1	1	15	15
376	13–7	4	6	6	6	9	8	7	8	34	32	35	0	10	9	4	4	5	6	4	1	6	5	3	14	15
377	12–7	6	8	6	0	9	9	7	0	34	27	40	5	8	9	8	5	5	0	0	–1	0	2	0	14	15
378	12–3	8	8	6	0	7	9	9	9	26	34	39	7	6	9	6	5	0	0	4	3	0	7	1	13	14
School No. 9																										
379	12–7	6	8	8	10	10	10	9	9	40	37	37	5	4	2	8	8	8	6	9	3	6	6	0	15	15
380	12–11	6	8	8	6	5	10	9	8	29	32	32	6	8	5	0	0	2	1	–1	2	0	5	0	10	10
381	14–7	10	16	8	8	10	10	9	8	37	38	37	7	10	8	8	6	0	0	4	7	5	5	6	15	15
382	14–0	8	8	6	6	9	10	9	9	29	35	37	–2	6	0	8	4	6	0	3	3	0	7	1	15	15
383	15–0	10	8	6	0	9	10	8	9	36	33	33	0	0	0	0	8	5	0	2	4	3	4	1	15	15
384	16–0	2	6	0	0	9	10	8	9	27	37	35	0	10	6	6	5	0	3	7	1	0	2	6	15	15
385	13–7	8	8	0	0	9	10	9	9	39	37	34	0	10	5	6	0	0	0	0	3	0	5	0	14	14
School No. 2										**Girls**									**Grade 4A**						
386	10–3	0	1	2	1	5	6	9	6	18	22	21	2	0	0	2	–1	2	0	1	2	0	0	1	15	13
387	11–1	2	6	2	6	3	5	7	8	10	32	27	3	0	2	4	4	2	6	8	7	6	4	1	15	15
388	10–3	5	0	6	0	3	5	7	0	4	21	20	–2	2	4	4	2	4	0	4	1	0	4	1	15	14
389	13–3	4	3	4	8	5	0	7	8	0	0	6	2	–2	0	0	0	0	0	3	1	0	0	1	15	15
390	11–7	2	0	4	8	6	6	8	8	22	27	28	0	4	0	0	0	6	3	0	2	3	0	0	14	13
391	11–6	1	0	4	0	4	7	8	6	27	27	23	–1	4	0	0	0	0	0	5	2	6	0	2	15	15
392	9–10	0	0	2	2	0	6	7	9	32	28	30	3	–4	1	2	3	5	6	7	2	6	3	2	14	15
393	9–5	1	0	4	2	3	5	7	0	24	23	15	–2	–4	0	2	7	7	0	2	2	3	3	1	15	15
394	9–11	0	0	4	4	5	4	5	8	23	29	21	–6	–4	2	0	2	2	3	0	1	3	4	0	14	15
395	9–2	0	0	4	2	4	5	0	8	11	20	15	0	4	7	2	4	4	4	5	0	4	4	1	15	15
396	8–11	1	2	6	4	3	6	6	8	34	27	19	4	7	2	0	1	1	1	7	5	3	1	1	15	15
397	11–3	2	6	2	2	5	8	8	8	20	26	20	2	2	5	2	4	4	0	4	1	0	1	4	14	10

School No. 3: 398, 399, 400, 401, 402, 403

School No. 4: 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424

School No. 6: 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439

TABLE IV—Continued

Child No.	Age Yrs. Mo.	I A	I B	II A	II B	III A a	III A b	III B a	III B b	IV A	IV B	IV C	V A	V B	V C	V D	VI a	VI b	VI c	VI A b	VI A a	VI A c	VII A	VII B	Spelling A	Spelling B
School No. 6										Grade 4A																
440	10—8	4	2	4	0	8	2	9	8	18	26	15	2	−4	5	−2	6	−2	3	−2	−5	−2	0	0	14	13
441	12—2	2	6	8	4	4	6	3	8	27	32	24	−6	4	−2	4	2	7	−3	8	4	−4	4	1	15	13
442	11—3	0	0	2	8	3	2	7	4	15	36	36	−3	2	−1	0	0	5	3	1	3	0	0	0	15	15
443	9—3	7	6	6	8	4	2	7	0	27	22	20	−2	0	1	0	9	6	3	6	0	4	0	4	15	15
444	10—0	0	0	3	0	3	2	3	0	22	35	25	−1	4	1	2	2	8	3	1	3	0	0	1	15	13
445	10—9	1	0	0	2	4	2	3	8	19	24	26	−4	2	3	4	2	4	0	3	7	4	0	1	15	12
446	11—5	3	0	4	2	4	0	5	8	22	23	25	−3	0	1	6	7	2	0	7	0	6	0	0	15	15
447	9—2	1	0	8	2	5	2	8	8	31	10	30	5	0	3	0	2	0	0	8	0	3	0	0	15	13
448	9—0	4	5	0	2	1	0	9	8	21	26	31	0	0	1	4	0	6	0	8	0	5	0	0	13	14
449	9—10	2	2	0	2	2	1	9	0	26	20	24	1	2	1	0	6	4	6	4	6	5	2	2	14	12
450	11—7	4	1	1	4	6	9	0	0	27	28	34	1	0	2	0	5	2	0	2	5	6	1	0	15	11
451	13—1	2	0	1	0	3	7	7	8	21	22	36	3	0	1	2	0	3	0	3	7	5	0	1	15	14
452	9—2	1	1	8	4	2	6	6	8	31	25	35	3	4	8	0	5	3	0	5	0	1	1	0	14	15
453	9—0	7	5	0	2	5	0	7	0	34	34	25	2	4	1	0	1	7	0	8	0	7	1	1	15	13
454	9—5	6	0	0	2	8	3	7	6	31	25	30	0	0	4	6	7	3	3	1	0	2	1	1	10	13
455	10—5	2	2	3	4	3	3	7	3	23	17	30	2	2	3	0	7	3	0	3	0	2	0	0	14	15
School No. 9																										
456	11—3	6	5	8	8	9	8	8	8	36	33	27	2	1	2	1	7	5	3	5	7	2	1	1	12	13
457	10—10	8	2	4	2	8	7	8	8	30	29	32	3	0	4	2	3	0	0	0	3	7	0	1	15	13
458	12—4	2	2	4	4	8	9	8	2	34	24	34	0	0	1	2	0	0	3	0	0	3	0	2	15	11
459	10—1	6	1	4	0	7	9	8	9	19	21	16	3	2	0	6	0	5	0	5	0	0	0	4	12	11
460	10—6	4	4	4	4	2	8	4	5	30	38	33	1	0	0	4	9	0	0	0	9	1	5	0	13	15
461	9—4	6	1	4	6	9	8	0	8	20	25	31	4	0	2	0	0	0	3	6	0	2	1	0	14	13
462	10—0	2	2	4	2	8	8	9	7	34	37	35	0	0	0	4	4	0	0	0	4	3	1	0	14	12
463	9—1	4	3	4	4	8	8	4	4	38	31	24	4	0	0	0	0	4	0	4	2	5	0	0	13	15
464	11—1	0	3	0	0	2	4	6	5	34	25	0	1	2	0	2	0	2	0	2	3	5	1	1	15	12
465	13—7	0	3	2	0	3	5	6	6	4	8	2	4	0	0	0	4	0	0	0	0	0	0	0	14	13
466	10—10	4	3	4	6	4	8	0	3	32	31	9	1	6	0	0	3	3	3	3	1	1	1	1	14	15
467	9—1	0	0	0	2	3	0	6	2	25	22	2	1	0	2	0	5	0	0	5	5	5	0	0	14	13
468	12—5	4	2	2	0	5	8	0	4	14	10	25	5	0	6	0	0	3	0	0	0	0	0	1	14	14
469	11—6	4	2	0	2	6	8	8	3	26	30	27	1	0	0	2	7	7	0	1	0	0	2	1	14	15
470	9—0	4	2	0	0	6	0	8	5	31	33	30	1	4	0	0	0	0	3	0	0	1	4	1	14	15
471	9—0	4	2	2	2	6	6	6	6	26	33	36	4	0	7	0	0	2	0	1	0	2	1	1	14	14
472	12—0	4	2	2	0	8	7	9	5	31	35	25	1	0	0	4	0	0	0	7	0	7	0	1	14	15
473	11—0	6	4	4	4	6	7	7	6	26	35	36	2	10	10	4	7	0	0	2	0	1	1	1	14	13
School No. 3										Grade 5B																
474	13—0	0	2	2	8	5	5	0	8	5	10	−2	4	4	0	0	2	−3	0	4	−5	2	2	2	14	15
475	10—7	4	3	6	4	5	9	9	0	33	33	−3	0	10	10	10	7	5	6	5	5	7	2	1	13	13
476	10—9	6	8	10	4	9	9	10	9	39	40	2	9	8	4	4	1	−3	9	5	−3	1	7	3	15	15

477	478	479	480	481	482	483	484	School No. 4	485	486	487	488	489	490	491	492	493	494	495	496	497	School No. 6	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519

TABLE IV—*Continued*

Child No.	Age Yrs. Mo.	I A	I B	II A	II B	III A a	III A b	III B a	III B b	IV A	IV B	IV C	V A	V B	V C	D	VI A a	VI A b	VI a	VI c	B a	B b	B c	VII A	VII B	Spelling A	Spelling B
School No. 6										*Grade 5B*																	
520	11– 2	8	6	7	0	7	10	8	6	16	21	20	–2	2	1	0	4	1	3	0	–2	–2	0	4	0	15	14
521	0– 9	4	4	7	2	6	7	0	8	30	30	32	–5	–4	0	0	7	0	0	3	–1	–1	0	3	4	15	14
522	11– 1	4	3	6	2	3	6	3	5	32	30	34	–3	0	0	0	0	4	–3	0	–1	–1	0	0	1	14	14
523	12– 4	6	0	6	4	3	5	3	0	19	26	26	–1	0	–3	2	7	8	6	0	0	0	0	3	2	15	15
524	10– 9	2	0	4	0	6	7	6	9	28	34	35	0	–4	0	0	9	–2	0	0	0	0	0	0	3	15	15
525	13– 2	6	6	2	6	5	5	6	6	16	4	4	5	0	3	4	5	4	0	1	–1	–1	4	0	0	14	13
526	11– 6	0	0	2	2	5	7	8	8	20	26	26	–1	0	–1	2	9	5	3	–5	5	5	0	0	0	13	13
527	12– 7	4	0	4	4	7	0	9	0	24	34	34	–8	0	0	6	6	0	0	–8	0	0	4	0	1	14	14
528	11– 0	4	0	6	2	6	8	7	9	29	30	37	0	0	2	2	2	6	0	2	8	8	0	1	1	12	15
529	12– 1	7	8	0	8	5	8	0	7	25	26	33	5	10	6	6	2	0	0	4	2	2	3	3	0	15	10
530	11– 1	10	8	9	4	3	9	9	8	28	33	35	1	2	–1	0	0	0	3	0	0	0	0	0	1	15	14
531	10– 2	2	10	6	4	4	7	0	0	19	25	30	–4	2	4	2	3	3	–3	7	0	0	9	2	0	14	13
532	10– 1	2	4	8	4	3	8	9	0	24	29	37	1	2	5	4	–1	4	0	0	0	0	1	2	2	15	14
533	10– 4	6	4	4	2	4	8	9	9	27	22	39	–3	2	2	–2	3	4	3	3	3	3	3	4	4	15	13
School No. 9																											
534	10– 5	6	2	10	4	7	7	7	8	36	30	34	–3	0	3	0	4	–4	0	2	0	0	7	2	2	14	15
535	13–11	8	2	6	4	7	7	7	9	14	27	33	0	2	0	4	3	–4	3	4	0	0	9	0	2	15	15
536	14– 3	5	4	4	6	5	6	5	0	30	32	26	2	6	8	2	4	4	3	7	0	0	6	2	0	13	15
537	10– 0	2	2	4	0	6	2	6	8	4	31	30	4	0	0	0	4	4	3	4	0	0	5	0	2	15	15
538	10– 0	8	3	4	0	6	8	6	9	31	28	16	5	0	0	6	4	0	3	0	0	0	0	2	0	15	13
539	12– 6	6	2	6	0	8	9	8	9	14	21	26	4	0	0	4	0	0	0	0	0	0	3	0	4	14	15
540	9– 0	0	3	4	8	9	7	9	7	34	30	27	–7	0	0	0	0	4	0	0	0	0	0	2	0	13	14
541	13– 1	4	0	10	8	7	4	7	8	10	31	40	0	0	0	0	0	0	3	0	0	0	3	1	0	15	14
542	10–11	3	4	0	8	9	9	0	8	37	34	38	1	6	6	8	0	0	0	3	3	3	0	7	0	15	15
543	8–11	3	2	6	8	0	6	0	8	37	31	35	–1	0	0	0	2	8	0	0	0	0	0	5	0	14	13
544	12– 4	3	2	0	6	6	9	9	8	34	31	32	0	6	0	0	2	0	3	0	0	0	0	2	0	13	15
545	10– 0	0	4	6	6	0	6	0	8	35	36	31	2	0	0	0	4	8	3	3	0	0	0	6	0	15	13
546	10– 3	0	2	2	6	8	9	8	7	30	35	28	1	6	6	6	0	2	0	0	0	0	3	1	0	15	15
547	12– 6	2	2	2	0	6	4	6	7	20	28	23	2	0	0	0	4	2	0	0	3	3	6	3	0	15	13
548	11– 0	2	2	2	0	5	7	5	7	20	20	36	6	0	0	4	0	2	3	3	9	9	3	0	1	14	14
549	11– 4	0	2	6	8	5	9	5	4	24	24	24	3	6	6	0	4	4	0	0	0	0	0	1	0	13	15
550	11– 0	2	8	0	8	5	7	5	8	33	33	31	4	0	0	0	0	0	0	3	0	0	1	1	2	15	15
551	13– 0	0	8	8	8	0	4	0	8	34	34	28	1	4	3	0	4	3	3	0	0	0	1	1	2	13	15
552	9– 0	2	3	0	2	0	7	0	8	20	31	27	1	10	1	0	0	4	3	0	3	3	0	1	1	15	12
553	13–10	0	5	0	4	6	9	6	8	37	36	24	1	10	0	4	0	0	0	1	0	0	2	1	1	14	15
554	9– 0	2	2	2	4	5	7	5	8	17	35	31	2	4	3	0	4	4	6	0	0	0	1	0	4	15	15
555	11– 0	0	6	2	6	5	0	5	8	25	27	28	3	2	1	0	0	4	0	3	3	3	6	2	2	14	12
556	10– 5	1	3	0	4	3	8	3	8	14	30	27	5	0	0	8	4	0	6	0	0	0	0	1	1	15	14
557	10–11	6	0	8	0	4	8	4	8	29	29	33	–1	2	3	0	0	4	0	5	0	0	2	1	4	14	15
558	10– 8	1	0	8	4	8	7	8	7	17	19	35	0	2	2	0	4	4	0	0	0	0	1	0	1	15	14
559	11– 5	0	0	4	6	9	8	9	7	17	17	22	0	2	0	0	4	4	3	0	3	3	4	0	4	15	14

Grade 5A

School No. 3

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School No. 4

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School No. 6

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TABLE IV—*Continued*

Child No.	Age Yrs. Mo.	I A	I B	II A	II B	III A a	III A b	III B a	III B b	IV A	IV B	IV C	V A	V B	V C	V D	VI a	VI b	VI c	VI a	VI b	VI c	VII A	VII B	Spelling A	Spelling B
School No. 9										**Grade 5A**																
603	11– 0	4	2	2	2	5	6	8	8	32	27	28	–3	4	–3	2	7	4	0	–7	–7	0	1	0	13	14
604	14– 1	6	8	6	8	8	6	8	8	35	30	31	–6	2	0	6	4	4	0	–1	–3	0	1	0	15	15
605	14– 1	2	2	2	4	4	5	5	8	28	29	36	0	2	–4	8	5	5	3	3	7	6	1	2	13	13
606	11– 1	0	8	6	4	8	8	7	8	28	26	34	1	–4	1	2	0	4	0	0	0	3	2	2	15	13
607	10– 3	5	8	0	4	7	10	8	8	32	36	38	–6	0	2	0	3	0	3	7	8	0	3	2	15	15
608	13– 0	2	4	10	0	4	7	6	8	3	3	9	0	8	0	8	4	3	0	3	7	3	0	2	14	15
609	11–11	6	9	2	8	5	9	5	8	31	31	30	0	8	0	8	2	4	0	1	1	0	1	0	15	15
610	11– 6	0	4	6	2	7	6	8	8	18	26	37	–5	–4	0	2	3	0	3	2	0	0	2	0	15	15
611	12– 4	0	1	4	4	4	10	8	8	24	25	21	2	0	2	0	2	0	0	1	1	3	1	5	15	15
612	12– 5	2	4	0	6	5	6	8	8	23	35	30	1	0	–3	2	3	4	0	0	0	3	0	1	15	12
613	11– 2	0	4	2	1	7	8	5	8	3	25	26	0	–2	1	0	2	0	0	1	8	0	1	1	15	15
614	12– 7	4	0	4	2	6	6	9	8	27	25	34	1	0	0	2	0	4	3	0	0	0	1	4	14	15
615	10–10	6	4	0	0	4	8	7	8	29	28	31	2	8	0	10	3	0	0	2	1	0	1	1	15	15
616	12– 3	6	2	8	8	6	8	7	7	30	33	31	3	0	5	0	0	2	0	0	8	4	1	1	12	15
617	11–11	8	6	10	10	8	9	7	7	30	30	34	3	0	–2	8	3	2	–3	3	2	4	4	1	13	15
School No. 2										**Grade 6B**																
618	11–10	4	4	2	5	5	3	8	8	33	28	28	5	5	1	–2	5	2	3	5	0	3	2	2	13	14
619	14– 5	4	5	0	5	5	5	9	9	30	0	4	–2	4	5	6	1	4	0	1	0	0	3	3	15	15
620	12– 5	6	6	8	6	5	10	7	9	31	2	28	9	6	9	4	7	5	6	5	5	4	1	1	14	15
621	10– 9	4	0	8	0	5	10	8	9	33	36	8	5	0	5	4	3	8	3	8	8	4	0	0	13	8
622	13– 4	4	8	0	8	5	10	8	9	36	30	34	2	0	0	4	1	0	3	0	0	6	5	2	15	12
623	12– 5	2	2	6	2	5	8	9	9	34	2	32	3	2	0	6	7	7	3	3	7	0	2	1	15	14
624	11–10	4	4	8	4	7	8	7	8	23	13	33	5	0	5	0	0	1	4	1	1	4	2	7	15	15
625	13–11	4	8	0	8	3	8	0	8	2	3	1	3	2	0	2	3	8	2	3	8	8	0	8	15	15
626	12– 2	10	0	4	2	7	10	9	9	38	32	33	6	0	0	2	7	7	3	7	7	0	2	8	15	15
School No. 3																										
627	14– 7	6	4	2	4	4	3	7	6	27	27	31	3	–7	4	2	5	–1	3	1	2	4	4	2	15	15
628	12–11	2	3	4	6	7	5	8	8	30	30	30	5	0	7	4	1	9	0	0	5	2	2	2	15	15
620	11– 7	7	4	8	4	7	0	8	7	33	33	38	2	6	8	10	7	5	0	7	3	4	2	4	15	15
630	10– 0	2	6	0	4	0	10	8	8	40	35	37	3	0	8	8	3	3	0	1	5	4	4	3	15	15
631	10– 7	6	2	2	0	8	10	9	9	37	36	26	–1	0	0	0	7	0	9	2	0	3	3	0	14	14
632	12– 0	6	2	4	8	6	8	8	6	27	37	35	4	0	9	8	1	1	6	1	1	1	0	2	15	14
633	12–10	0	4	6	4	0	9	8	0	34	33	36	–1	1	7	8	0	2	0	5	2	8	2	8	15	14
634	12– 0	4	4	2	2	7	9	6	6	34	21	36	3	0	–2	8	0	5	0	2	5	4	0	0	10	15
School No. 4																										
636	13– 3	2	2	2	0	7	9	8	7	17	34	34	3	–2	0	2	4	0	3	0	0	0	4	2	15	15
637	13– 2	8	10	10	6	10	10	8	8	38	36	38	5	1	9	6	1	7	0	5	7	0	1	0	15	15
638	12– 2	0	5	8	10	9	10	9	9	35	31	33	3	0	4	0	0	0	0	0	0	0	1	0	14	15

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TABLE IV—Continued

Child No.	Age Yrs. Mo.	I A	I B	II A	II B	III A a	III A b	III B a	III B b	IV A	IV B	IV C	V A	V B	V C	V D	VI A a	VI A b	VI A c	VI B a	VI B b	VI B c	VII A	VII B	Spelling A	Spelling B
School No. 9										**Grade 6B**																
682	11—0	8	6	4	8	4	8			26	34	20	2	0	2	6	7	6	3				4		14	15
683	11—11		8	10	10	3	10		8	15	28	38	0		8	8	4	6					2	1	15	15
684	12—0	2	2		4	6		10	2	37	22	32	2	2	0	2	4						1		15	15
685	12—11	6	6	8	6	9	6	8	4	31	25	32	3			8	7	8	3				3	1	15	15
686	12—6	10	4					8	3	33	30	39	1	5	3	6	0	2		6			0		15	14
687	13—1	8	0	6	6	3	8	7	3	33	35	33	4	7	3	6	2	2		4	3		3	0	15	15
688	12—6	6	0	6	8	6	6	8	7	28	19	31	0	0	3	8	4	4	3	9	8		0	0	13	15
689	13—1	6	4	0	8	3	10	8	8	23	36	40	6	1	3	8	2	2	7	3	8		0	4	15	15
690	12—6	6	8	8	8	8	7	8	8	40	36	38	5	5	0	6	2	4		8	8		5	5	15	15
691	11—11	0	4	0	0	6	0	8	8	28	38	38	5	3	0	8	4	2	8		6		0	0	15	15
692	12—7	6	6	8	8	5	9	8	8	36	33	35	0	5	0	8	2	4	3	6	7		6	4	15	15
693	10—9	0	8	0	6	9	9	8	8	34	38	30	6	3	6	8	2	8	3	3	7		6	5	14	15
694	12—1	2	2	4	4	0	8	8	8	37	36	39	0	2	6	8	4	6	0	2	3		1	0	15	15
695	11—0	10	0	8	8	9	0	8	8	32	33	35	3	0	0	8	6	0	3	3	8		6	2	15	13
696	13—4	6	6	0	8	0	8	8	6	24	28	30	0	2	6	8	8	3	0	5	9		4	0	15	13
697	13—2	4	6	0	8	7	7	5	3	30	35	34	0	1	0	8	0	0	3	2	3		1	2	13	15
698	12—0	6	0	8	8	7	7	3	7	24	34	37	0	4	0	6	1	8	0	3	7		2	0	13	15
School No. 3										**Grade 6A**																
699	13—5	7	10	8	6	6	6	0	6	33	23	34	1	4	2	8	0	0		7	7		0	2	13	14
700	11—5	10	8	7	0	0	0	8	8	38	36	37	4	7	8	8	4	8	3	5	3		0	1	15	15
701	11—8	5	8	0	8	0	8	0	0	38	38	38	4	0	6	6	0	0		5	3		0	1	14	15
702	13—4	0	2	6	0	4	7	0	8	27	37	38	2	0	0	0	3	3	3	2	5		1	4	15	15
703	13—1	7	6	8	6	0	0	9	8	34	35	35	6	4	3	8	3	3		3	5		4	0	15	15
704	11—7	0	5	0	8	0	8	0	8	37	39	35	0	1	8	6	7	7		3	3		0	6	15	15
705	11—2	10	4	8	0	0	8	0	8	38	39	40	5	7	8	8	9	7		3	3		6	3	15	14
706	12—0	7	0	0	6	0	8	0	6	39	37	30	5	0	6	8	4	0		6	0		2	1	14	15
707	12—0	8	8	6	0	0	0	0	0	32	28	40	3	0	8	8	0	0		9	6		2	1	15	14
708	10—10	8	0	4	0	0	0	0	8	30	31	38	0	0	0	8	4	0		3	3		2	0	15	14
709	12—9	7	6	6	0	8	7	8	8	34	34	39	1	0	8	6	0	7		3	3		2	1	15	12
School No. 4																										
710	10—5	6	10	0	0	8	0	0	0	36	36	37	5	0	3	8	3	5		3	9		0	1	15	15
711	12—7	0	8	0	6	9	0	8	8	29	35	38	4	3	6	8	5	3		0	3		2	1	15	14
712	13—4	8	8	6	0	7	0	8	0	30	31	38	5	0	0	2	0	0		0	0		5	5	15	15
713	12—1	8	0	0	6	8	8	8	8	34	35	38	6	0	6	8	0	0		4	3		3	0	15	15
714	10—0	8	0	6	8	0	0	8	8	32	26	38	0	8	0	8	6	7		8	3		3	1	15	15
715	11—0	8	0	6	0	0	9	6	6	28	37	40	2	0	0	6	0	2		8	3		3	1	15	15
716	11—1	8	0	8	6	0	6	0	0	31	34	38	7	0	3	8	2	5		7	0		3	1	15	15
717	11—7	7	0	2	0	0	5	0	0	38	32	37	7	4	0	6	4	4		3	3		3	1	14	12

School No. 6

School No. 9

718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757